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[OFFICIAL NOTICE.]

Eighteenth Annual Meeting of the American Gas Light Association.

EXTRACT FROM THE CONSTITUTION:—Sec. 12. *Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least ten days prior to the meeting at which the application is acted on.*

OFFICE OF THE SECRETARY,
LAWRENCE, MASS., Sept. 15, 1890.

To the Members of the Association: Gentlemen—The Eighteenth Annual Meeting of the Association will be held at Savannah, on Oct. 15, 16, and 17. The headquarters will be at the De Soto. The members will be called to order on the morning of Wednesday, Oct. 15, at 9.15 o'clock, by the President, Emerson McMillin, Esq., when the Association will be welcomed to the city of Savannah by his Honor the Mayor.

We now have the following papers promised, so that we are guaranteed a good literary programme:

"The Extension of the Use of Gas for Purposes other than Illumination," by E. G. Pratt, Des Moines, Ia.

"The Mismanagement of Gas Works," by E. G. Cowdery, Milwaukee, Wis.

"Gas Coals of the United States," by H. C. Adams, Phila., Pa.

"The Practical Efficiency of an Illuminating Water Gas Setting," by A. G. Glasgow, Philadelphia, Pa.

"Inclined Retorts," by Frederic Egner, St. Louis, Mo.

"The Gas Engineer and his Pencil," by F. H. Shelton, Phila., Pa.

"Purification of Gas," by A. E. Forstall, Chicago, Ills.

"Suggestions of Methods and Systems for Recording the Histories and Accounts of Gas Light Companies," by Wm. P. Fodell, Phila., Pa.

We also expect a paper on the Pintsch Lighting System.

I would repeat my invitation of former years for members to send along in advance their puzzles for the question-box.

The meetings of the Association will be held in the banquet hall of the De Soto, on the first floor directly over the dining room, not on the top floor, as previously stated by me through error. It will be an agreeable feature of the convention to have our meetings in the hotel selected as our headquarters.

I want to call the attention of the members to the bulletin board which will be placed in the rotunda of the hotel. Notices in regard to the meeting will be posted thereon, and it will be well for the members to consult the same from time to time.

As much valuable time is usually lost in calling the roll of the Association, and as we then have but an inaccurate list of the members present, it is proposed this year to have the members hand in their names to an attendant as they enter the meeting hall for the first time; of course, members will only be expected to give their names once.

A new feature of our meeting will be the welcome which will be extended to the members by His Honor the Mayor and the members of the City Government. In order that the time of the Association usually allotted to business be not taken up by this courtesy, it has been arranged that the Association come to order for the purpose of hearing the Mayor at 9.15 A.M. We will then be ready to take up regular business at 9.30 o'clock.

I would remind those members who have not already sent checks for their dues, that the Secretary will take it as a favor if they will give this matter their attention, as it will help him greatly to have the collection of the yearly bills disposed of before the meeting.

As previously announced, the rate given us at the De Soto is $3.50 per day, board included, and a discount will be made from this figure if the attendance is large; it is hardly necessary to add that bathrooms and parlors will be charged for extra. It is earnestly hoped that all the members will make the De Soto their headquarters, as they will thus help in obtaining a low rate for the members.

Matter of transportation is dealt with in another circular.

From letters received by the Secretary it appears that we are to have a large gathering at Savannah, and he is very glad that it is to be so, because there is every reason to hope that the meeting will be both profitable and pleasant. The citizens of Savannah are looking forward to the meeting with pleasurable anticipations; and as they are so ready to extend to us a hearty welcome, it is but just courtesy that there should be a large number present to acknowledge their kind attention. The local papers have been more than ordinarily attentive in keeping the matter of the meeting before the people, and in this connection special mention should be made of J. H. Estell, the proprietor of the *Morning News*, who, by the by, was the second newspaper man in this country to use the new large cylinder press.

It is hoped that not only will we have a large number of members present at Savannah, but also that they will bring their ladies, as special arrangements are being made for their entertainment; a Committee of Reception has been selected from Savannah's fair ladies to assist the

United Gas Improvement Company and the Mutual Gas Light Company in their entertainment, and they will devote themselves especially to the care of the ladies. Carriage drives will be tendered the ladies, who will thus have the opportunity of visiting the many attractions of Savannah; visits to Telfair Art Gallery, the Historical Society Building, and Bonaventure will be among the attractions offered. It is also expected that an informal hop will be the programme for one of the evenings. Of course, it will be informal, so the members and ladies will be free to spend as much or as little time at the dance as they desire. *En passant* I would remark that probably this announcement of a hop will cause our young members—and possibly the older ones also—to shake out their dress suits and arrange to take them along with them to the Sunny South; I also presume that the ladies will be glad of an inkling of this attraction in order that they may have the opportunity to come prepared.

On Thursday evening the Association will be tendered a banquet by the United Gas Improvement Company and the Mutual Gas Light Company, of Savannah; the large dining hall of the hotel will be the scene of the festivities, and there will be present in addition to the members of the Association, the Mayor and other officials of the city and a number of other prominent citizens.

On the last day of the meeting the members and their ladies will be tendered an excursion on the river, when we will have as our hosts the same Companies to whose courtesy we will have been indebted for the banquet of the previous evening, and for the many entertainments provided for the ladies.

Transportation.

September 20, 1890.

Again let me impress upon the members that Savannah is within easy reach of most of our members. Leaving Boston 7 o'clock Sunday night, Savannah would be reached by 6.44 Tuesday morning. Getting away from New York Sunday, at midnight, the trip would end Tuesday morning at 6.44. From Chicago, one route is over Illinois Central to Cincinnati, thence by Queen and Crescent, Western and Atlantic and Georgia Central; time, 39 hours. Time from Cincinnati, 34 hours. From St. Louis, via Louisville and Nashville, and Nashville, Cincinnati and St. Louis and Western and Atlantic and Georgia Central; time, 34 hours. Or those living in the vicinity of New York or Boston who prefer an ocean trip can take one of the Ocean Steamship Company's vessels from New York or Boston, and land right at the city, the trip taking from 48 to 55 hours. The rate by this route, including meals and berth in stateroom—first-class—is, from New York, $15, or $25 for the round trip. From Boston the rate is $17 one way, or $29 for the round trip. Those desiring to secure these special rates must obtain a proper certificate from me.

I have secured from the following Passenger Associations the usual concession in railroad rates, namely: The Southern Passenger Association, composed of the following companies: Alabama Great Southern; Atlantic Coast Line; Atlanta and West Point; Brunswick and Western; Charleston and Savannah; Central Railroad of Georgia; Cincinnati, New Orleans and Texas Pacific; East Tenn., West Virginia and Georgia; Georgia Railroad; Georgia Pacific; Illinois Central (lines south of the Ohio river); Jacksonville, Tampa and Key West; Louisville and Nashville (lines south of the Ohio river); Louisville, New Orleans and Texas; Mississippi and Tennessee; Mobile and Ohio (lines south of the Ohio river); Memphis and Charleston; Nashville, Chatta. and St. Louis; New Orleans and Northeastern; Norfolk and Western; Pennsylvania (lines south of Washington); Port Royal and Augusta; Raleigh and Gaston: Richmond and Allegheny; Richmond and Danville; Richmond, Frederick and Potomac; Rome Railroad; Savannah, Florida and Western; Seaboard and Roanoke; Shenandoah Valley (lines south of the Potomac river); South Carolina Railway; Vicksburg and Meridian; Western and Atlantic; Western Railway, of Alabama.

Trunk Line Association, composed of the following railroads: Grand Trunk; N. Y. C. & H. R.; West Shore; N. Y., O. & W.: N. Y., L. E. & W.; D., L. & W.; Lehigh Valley; Central Railroad of N. J.; Phila. & Reading: Pennsylvania; Balt. & Ohio; Ches. & Ohio.

Central Traffic Association: The New York and Boston lines, composed of the various lines between the two places named.

The territory covered by the Trunk Line Association is as follows: From Niagara Falls; Buffalo; Salamanca, N. Y.; Pittsburgh, Pa.; Bellaire, Ohio; Wheeling, Parkersburgh and Charleston, W. Va.; and points east thereof, except New England.

The Central Traffic Association covers the following ground: Bounded on the east by Pittsburgh, Salamanca, Buffalo, and Toronto; on the north by the line of and including points on the Grand Trunk Railway, from Toronto to Port Huron, thence via Lakes Huron and Michigan to the north line of Cook county, Ills.; on the west by the west line of Cook county and the Illinois and Mississippi rivers to Cairo, including the Burlington, Keokuk, Quincy, Hannibal and St. Louis; and on the south by the Ohio river, but including points on either side of that river, while the territory under the Southern Association is south of the territory above mentioned.

The usual concession in railroad rates has been granted, namely: one-third off on the round trip. That is, members will pay full fare going, obtain a certificate from the ticket agent from whom they purchase their tickets, and upon presentation of this certificate at Savannah (after being duly endorsed by me), they can obtain the return ticket at one-third the usual rate. To illustrate: The regular fare from Chicago to Savannah is $23.30, and a member starting from the former city will pay that amount for a ticket to Savannah. At the time of purchasing his ticket he obtains the necessary certificate from the agent; he has that endorsed by me at Savannah; then, on presentation of the same to the ticket agent at Savannah, he can procure a return ticket for $7.77. The regular fare from St. Louis is $20.55; from Cincinnati, $19.30; from Boston, $20.75.

Parties starting from New York or Boston can obtain their tickets from the agents of the Atlantic Coast Line or Pennsylvania Railroad.

The offices of the Atlantic Coast Line are: New York, 229 Broadway; Boston, 228 Washington street; Philadelphia, 33 South 3d street; Baltimore, 233 East German street.

The following extracts from the regulations of the railroads are cited for the information of the members:

First. Each person desiring the excursion rate must purchase a first-class ticket (either limited or unlimited) to the place of meeting, for which he will pay the regular fare, and upon request the ticket agent will issue a printed certificate of purchase of the standard form as shown in this circular.

Second. If through tickets cannot be procured at the starting point, parties will purchase to the most convenient point where such through tickets can be obtained, and repurchase through to place of meeting, requesting a certificate from the ticket agent at the point where repurchase is made.

Third. Tickets for the return journey will be sold by the ticket agents at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to place of meeting was purchased, and countersigned by signature written in ink by the Secretary or Clerk of the Association, certifying that the holder has been in regular attendance at the meeting.

Yours truly, C. J. R. Humphryes, Sec'y.

BRIEFLY TOLD.

In the Sunny South.—Before many of our readers shall have received this issue of the Journal the annual convention of the American Association will have adjourned, and its record for 1890 shall have been made. It is with exceeding satisfaction nevertheless that we make the prophecy, which is yet timely, that everything points to a most successful meeting, the technical portion of which cannot fail to at least equal in interest and value any that we have had in the past. As far as the outing-time is concerned it only remains with the weather clerk whether or not the hours of relaxation are to be enjoyed to the full. The programme cannot be improved upon, and our entertainers are of the true-blue order, hence let us hope that the Sunny South will put on its brightest face, that the good things provided may be shared in with the zest that springs from our perfect autumn days.

Obituary Note—William Heilman.—We regret to be called upon to chronicle the death of Mr. William Heilman, one of the most respected and prominent citizens of Evansville, Ind., whose demise occurred, at his home in that city, on the morning of September 22. Deceased was born in the town of Albig, Rhenish Hesse, Germany, Oct. 11, 1824, and came to this country in 1843, landing at New Orleans, subsequently removed to St. Louis, and eventually settled in Evansville. Originally a farmer, he subsequently, in connection with Mr. Christian Kratz, engaged in the foundry business, continuing therein up to the time of his death—Mr. Kratz left the firm in 1864. About 1866 the Evansville Gas Company was founded, largely through Mr. Heilman's efforts. He invested his money largely in the enterprise, was elected its President in 1870, and for several years was virtually its manager. To enumerate his business interests in Evansville would be somewhat of a task. Suffice it then to say that his influence was very marked on the growth and development of the affairs of his city. His political preferment was very marked, and although his Congressional district was stoutly democratic, he nevertheless (a staunch republican) represented it in Washington. He was much esteemed, and rightly, too, for his methods were always those that actuate men of probity and honor.

[Read by the author at the New York meeting (Oct., 1890) of the British Iron and Steel Institute.]

Fuel Gas and Some of its Applications.

By Mr. Burdett Loomis, Hartford, Conn.

The advantages of gaseous fuel have been too fully set forth during the past few years to need recapitulation. Papers, arguments and editorials have been issued, in a more or less general way, that would make volumes. Systems have found zealous advocates, and promises of results made, that have sounded strangely in the ears of old-fashioned gas makers, have been born of theory, and have died in the earliest throes of trial; while in some few instances success has demonstrated the value of practical effort. With few exceptions, however, everything attempted or accomplished has tended towards the one end—the realization of more perfect results than we can obtain with the direct use of solid fuels; and there are to-day few to dispute the coming supremacy and general use of gaseous fuel.

It is not assumed that the solid fuels will be wholly superseded; such an assumption would be folly, as there are circumstances in which solid fuels must continue in use, from necessity or economy. These, however, are few, and can almost be named in a breath; while the purposes for which the gaseous fuel is not only cheapest but best, are so many as almost to defy enumeration. Wherever constant high-flame temperature is necessary, the gaseous form must find precedence, while its easy carriage to long distances, and its attainment of maximum temperature almost instantaneously with ignition, give it a leverage that is scarcely covered by that easy term—convenience.

The discovery and application of natural gas has not only borne the weightiest of testimony on behalf of the general necessity for fuel gas in nearly all fields, but it has done more. Its wide scope of service, from the great establishments wherein thousands use it constantly, to the cottage where it saves countless steps for the housewife, has demonstrated the necessity for a gas of general application that will fulfil all the demands of the manufacturer, and meet the wants of the domestic user. The fuel gas that is to score a wide success must fill these conditions. For a gas that will not, the field is limited.

In the manufacture of a fuel gas, then, it is obvious that certain conditions are primarily necessary.

As concerns the apparatus to be used, these are:

1. *Simplicity.*—It must be easily and cheaply worked, and require a minimum of skilled labor.

2. *Durability.*—It must do its work with but little repair or replacement.

As to the material to be used in the manufacture of the gas the conditions are:

1. *Richness.*—It must contain the necessary carbon.

2. *Cheapness.*—It must be generally obtainable in large quantities at low prices.

These qualifications are met by the slack or fine bituminous coals, which are the least expensive of all coals, and are obtainable in nearly all markets at low rates,

These points established, it remains to decide upon the kind of gas to be made. This must be calculated to meet all the wants of those for whose use it is intended. Here we find it necessary to consider the following:

1. *Quality.*—The gas must contain all the carbon possible, consistent with the other necessary conditions.

2. *Cost.*—It must be low in cost, especially in view of its use in large quantities.

3. *Cleanliness.*—It must be as free as practicable from impurities, and must be clean as regards the more perceptible.

4. *Transmission.*—It must be capable of easy carriage to reasonably long distances, and through small as well as large pipes.

5. *Temperature.*—It must have a constant high-flame temperature, and must ignite under all conditions, when desired.

For general adaptability to the wants of all classes of consumers, the requirements named must be met, and the more completely met, the greater will be the success of the gas offered.

In many cases a good producer gas accomplishes all that is needed, and, used in a well constructed regenerator furnace, is much cheaper than coal; but its usefulness is confined to places where such furnaces can be constructed, if high-flame temperature is required, or where low heats are sufficient, and obtained without regeneration. Outside of such confines it is not economical and is seldom useful.

Without discoursing on the relative merits of other gases, I believe that the gas best suited for general fuel purposes is water gas. Its flame temperature is high, it is cleanly, reasonably free from impurities, and it can be transmitted to long distances.

The one possible factor to which objection might be made is its cost. If it meets this requirement there is no further bar to acknowledgment of its claims. Can it be made from the cheapest of materials offered in the general market for gas making purposes? In discussing the lions in the path of success in this direction, the London *Journal of Gas Lighting*, some months ago, pronounced the following ultimatum:

"The slack, however wet, dirty, dusty, sulphurous or stony, should be tipped into the hoppers of the gas making cupolas, and gasification should go on continuously and completely, so that nothing but gas and ashes should remain of the material put into the apparatus."

This can be done, and is done, in many places, with the Loomis apparatus, which is using the cheap coals mentioned, as well as the more expensive anthracite coals and coke. This apparatus is the only one that I know of in successful operation making water gas directly from the bituminous slack coals that are found in abundance in many parts of the world. It is a simple fuel gas generating machine, and it will not only make as much water gas from a ton of this slack coal as can be produced by any other method from the same quantity of anthracite or coke, but it also utilizes the blast gases for making the steam necessary to run the engines and exhausters, and for decomposing, leaving a surplus for other work; or the blast producer gas or generator gas can be used in regenerative, reheating, annealing, melting furnaces, etc. For these purposes the producer gas made by this apparatus answers all requirements, as can be shown by demonstration in the several places where it is so used.

Water gas generators, to be economical producers of gas, must be so constructed that they will continuously make a first-class quality of gas for the full period of a 24 hours' run. In all the generators using the up-blast system, after a few hours' run the quality of the gas has become much poorer than at the beginning when the fires were fresh, on account of the clinkers and ashes that accumulate.

In the Loomis generator this is obviated, and the gas is of as good quality at the end of a 24 hours' run as at the beginning or any part of the run. This is due to the peculiar construction of the generator, and the action of the exhauster in collecting the ashes at the bottom of the fire and in the ashpit. In the process of exhausting before making a run of water gas, this is highly heated and useful for superheating the steam before it strikes the incandescent coal, and in this way the carbon is nearly all extracted from the coal, less clinker is made, the gas is freer from carbonic acid, and increased production is obtained.

In the matter of quality, a high grade of product should be aimed at, and the water gas made as pure as possible, so that it can be used, where practicable, without purification. In works where it must be purified, the better the quality of the gas the less the expense for purifying.

The claim has been made that the water gas that can be made from a given amount of coal must be less economical than the coal used directly, both on account of the smaller number of units of heat contained in the gas and the labor and expense of making. Where coal can be well fired, and gases economically burned direct from the furnace, this is in many instances true; but the great fields for water gas lie in the special uses for the many kinds of metallurgical work and kindred work where coal directly used cannot enter as a comparative factor, and for domestic purposes, where the gas is proving itself as cheap as the coal, if not cheaper, while it accomplishes results that are not obtainable with the solid fuel.

In estimating the economy of its general uses, another factor must be considered. This is application. In this particular the threshold of investigation has scarcely been crossed, yet much has been accomplished, while the future is fruitful of certain realization. Until lately the gas has not been obtainable for the purposes of experimenting in large quantities, and as yet, in special work, the methods of application are comparatively crude. Within the past few years, however, much has been done in the face of untoward circumstances, and you can now be shown the gas in use in many ways where it has supplanted coal, and wherein it has been found more economical than to fire coal, without taking into consideration any other features of advantage.

In nearly all branches of metallurgical work wherein the gas can be applied, however, there is found:

1. An increased product.
2. A better grade of product.
3. Direct economy in cost.

Increase in amount of product arises from the saving in direct labor, as can be most easily seen, perhaps, in forge shops and the like, and

from the gain in the personal condition of the workmen, owing to the increased healthfulness of their surroundings.

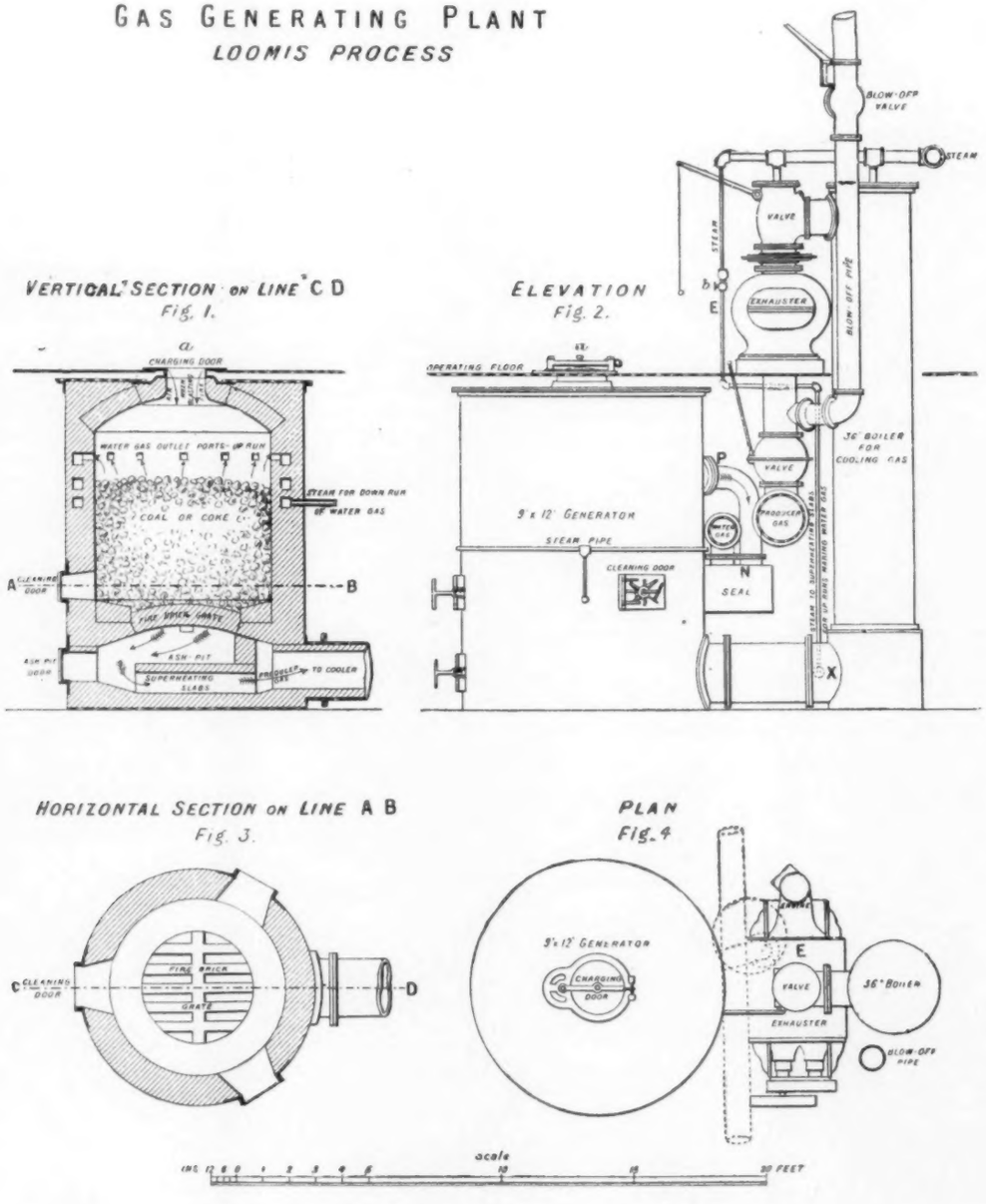
The gain in grade of product arises chiefly from the uniformity in the temperature and the quality of the fuel.

The economy in cost needs no explanation. I may state, however, that in some large works which have changed from coal to the use of fuel gas, the gain in direct economy has been proven to be from 33⅓ to 50 per cent. in labor and over 40 per cent. in fuel.

In many instances the gain, from having a sharp, quickly heating flame, is such as to overbalance the question of more direct saving in cost of production, and it is not infrequently demonstrated that, by this cation. This perhaps may seem of minor importance, but in these days of sanitary investigation and of shortening the days of labor, it will be found no little advantage to keep the temperature of the workroom as far as possible under control.

In many parts of the world inventors are devising new applications of this gas, and with marked success. It is so well made and so easily handled, that its application in many new channels amounts to little more than ordinary manipulation and direction by those who understand the work to be done.

Among the several places in this country where the gas made by the process I have named has been applied to such a variety of uses as plain-



means, workshop material enough is saved to alone pay all the productive cost of the gas.

Another feature worthy of consideration is economy of space in locating furnaces or other appliances for the use of the gas, especially where it is desirable that these should be grouped together as closely as possible. It also renders possible the location of furnaces, heaters, forges, etc., just where desired, without necessity for considering the questions of convenience that frequently arise where there must be either coal carriage or storage.

With this, too, may be considered the fact that the heat from the gas is brought under closer control than that from the coal fires, and less heat is generated into the room or space surrounding the point of appli-

ly shows its adaptability as a general fuel, as regards both efficiency and cost, are the saw works of Henry Disston & Sons, which you will be invited to examine on your journey from New York to Philadelphia. There you will see the generators at work on steady and continued runs, and will see the two gases, *i.e.*, the water gas, and the producer gas that is made intermittently with the water gas, both carried to holders, and delivered under pressure at different parts of the works.

This is the first place of which I have knowledge where producer gas has been stored in a holder, and thence delivered cold to different furnaces at distances from the generators, being fired cold at such distant points. The process of manufacture and the manifold utilization of the different gases, but especially of the water gas, will be of interest. Full

facilities for a thorough examination of the process of manufacture will be given, as well as full liberty to make any tests or experiments desired.

Estimated cost of 1,000,000 *feet of water gas based on actual results; coal at* $3 *per ton.*

Coal, 25 tons, $3 per ton	$75.00
Coal for steam, 3 tons, $3 per ton	9.00
Labor	22.00
Extra for supplies and repairs	4.00
Purifying	5.00
	$115.00
Received for producer gas	40.00
	$75.00
Interest on plant and depreciation	25.00
	$100.00

Cost per 1,000 feet, 10 cents.

In the practical using of water gas, 20,000 feet often accomplishes better results than a ton of coal directly fired; in some cases more is used. This has been accomplished by new and improved methods of application, and will be improved upon as necessity demands and appliances are perfected.

I may say, in conclusion, that in no place where this gas has been put in use has any thought been given to a return to coal. The solid fuel, once supplanted, will never be sought for again.

Description of the Loomis Generator.

Figs. 1 to 4 show the way in which producer gas and water gas are made alternately.

In bringing the coal to an incandescent state for making water gas, the door *A* is open, and the exhauster *E* is started and draws the air down through the coal and ashpit and up through the cooling boiler, and the producer gas made by this operation is forced through the pipe *C* to the holder.

When the coal is in the proper state for decomposition of steam, the exhauster is stopped and the door *A* shut, and steam is let on at the valve *B* at point *X*, and it passes through the ashpit and grates, where it is highly superheated, then through the mass of coal, making water gas, which passes out at *P*, through the seal box *N*, to the water gas holder.

After a run of about five minutes the steam is shut off, the door opened, the exhauster started, and the process of making producer gas is again commenced.

Since the foregoing paper was written the following actual results have been obtained melting brass in crucibles with water gas with improved furnace:

In melting 2,000 lbs. of brass in 100-lb. crucibles, 12,000 cubic feet of water gas was consumed.

In using same size of crucibles in works that are melting from 5 to 10 tons per day with coal, it takes 2,000 lbs. of coal for 2,000 lbs. of brass.

Units of heat in 12,000 feet water gas used	3,600,000
Units of heat in 2,000 lbs. coal used	27,000,000

Or 7½ times the amount that is in the gas used.

One ton of coal will make 40,000 cubic feet of water gas, which will accomplish as much as 3½ tons of coal in this work.

The cost of labor in making water gas will be less than in firing coal direct. The producer gas made, in addition to 40,000 feet of water gas from a ton of coal, will yield all the steam needed and pay interest and repairs on the plant.

The coal used for making the gas, being bituminous slack, only costs two-thirds as much per ton as that used with direct firing.

One ton of coal to make the gas, costing $3.

3½ tons at $4.50 per ton will cost $13.50.

Saving on coal in melting 3½ tons, $10.50.

As it only requires two-thirds the time to melt with gas that it does with coal, here is a great saving; and less space is needed for the furnaces, as only one-third the number are needed. Metal is not wasted in the ash, and crucibles will last much longer.

In estimating comparative cost of labor and fuel in making water gas from bituminous or anthracite coal there is, in the Eastern States and England, a difference of about $1.50 per ton between the cost of bituminous slack and coke or anthracite, and the estimate will be made on that basis. Where it is more or less, allowance can be made.

Two thousand pounds of Cumberland slack will make 40,000 cubic feet of water gas, with 340 heat units per foot, or 13,600,000 per ton.

Cost of coal	$3.00
Cost of labor per ton	1.00
Producer gas makes steam.	
Total	$4.00

Making 1,000,000 heat units costs about 30 cents. If the balance of producer gas could be utilized after making steam, it will reduce the cost of the water gas as low as 25 cents.

Two thousand pounds anthracite coal or coke—

Cost per ton of coal	$4.50
Cost of labor per ton coal	1.00
Coal for steam.	.75
Total	$6.25

If it makes 40,000 cubic feet at 300 heat units per foot, or 12,000,000 per ton, 1,000,000 heat units would cost 52 cents, or nearly double that made from bituminous slack. The extra units of heat in gas made from bituminous coal are obtained from the marsh gas and illuminants, which give the gas a decided odor.

The members of the Institute are invited by the Waltham Watch Company to visit their works, where they will be shown a variety of uses different from what can be seen at Disston's.

Also, Mr. J. Edward Addicks, of the Boston Gas Company, will be pleased to have their gas works shown to any members of the Institute who may visit Boston, and there see the fuel water gas made and measured with a meter, and the producer gas used to fire boiler, to make steam, and to heat retorts to volatilize the oil to carburet the water gas to make it illuminating. The Boston Gas Company will distribute the fuel gas through 6 miles of main by Nov. 1.

The quantity and quality of the water gas made there is over 40,000 cubic feet, of 340 heat units per foot, from 2,000 lbs. of Cumberland coal.

The Akron Fuel Gas Company, Akron, Ohio, have 10 miles of mains, and are distributing the water gas for household and other uses.

The Use of Gas for Heating, Cooking and Trade Purposes.*

By A Gas Inspector.

The importance which is now, on all hands, being attached to the question of the use of coal gas for heating, cooking, and industrial purposes, and the future that lies before this department of the gas industry will, I think, be sufficient justification for bringing before the readers of the *Journal* the following thoughts, based as they are upon an experience resulting from some years' work amidst all classes of gas consumers. Constant communications with the intelligent and business classes of the gas-consuming public upon matters relating to gas supply are interesting and helpful; and if they are made the subject of careful consideration, they may become the means of establishing happy and healthful relations between the producer and the consumer.

In an article contributed to the *Journal* some months ago, I brought under notice certain suggestions which, originating in conversations with the consumers of the gas company with which I am connected, wherein their ideas and requirements have been fully laid before us, have commended themselves to our minds; and their adoption has usually been very successful—the existing relations with the consumers being improved, and consequently the commercial basis of the undertaking more firmly established. The suggestions thus put forward—bearing chiefly upon the facilities which might be offered for the furtherance of the use of coal gas in every direction—deal, from a consumer's point of view, with such matters as money securities, short-period contracts, security or guarantee contracts, etc.

As the preliminary step to the use of gas for cooking, heating, etc.. is, of course, the introduction of a supply, I must briefly touch upon the means that have been suggested for removing the obstacles so generally presented to the prospective consumer before his service can be laid on. Doubtless the chief of these difficulties is the deposit which, as a rule, is at the very outset demanded of him. I do not share the confidence of many with regard to the assistance supposed to be derived from the deposit in the due collection of the accounts; and for reasons which have already been fully set forth in the columns of the *Journal*, I am assured that in many cases—probably by far the majority—this deposit may, with great advantage, be entirely dispensed with. I do not however, recommend the granting of supplies indiscriminately. There are means other than money securities by which the due payment of the accounts may be assured, and which, if perhaps not quite so reliable, are so much better adapted to the consumers' requirements and conven-

*London *Journal*.

ience, that, by popularizing the use of the gas, they would more than compensate for any isolated cases of loss arising from the departure from the old system.

The substitutes for money securities include the establishment of a system of reference between the various gas undertakings, whereby the antecedents of an applicant for a supply of gas might be ascertained prior to the preparation of a contract; also the system of guaranteeing payment on the part of some well-known consumers; and, further, in order to meet as far as possible the convenience of the consumer, the granting of short-period contracts. The numerous advantages of monthly and weekly contracts have been well brought to the front of late, and have been fully discussed at meetings of the Gas Institue and similar gatherings. Suffice it to point out here that their desirability is greatly emphasized by the experience of the public as regards the easy terms upon which illuminating oils can be supplied, and which have of late tended to advance the oil trade so materially. I would further refer also to the matter of the charges to be made for laying on a supply of gas. These should be as light as possible; and, if the finances would allow, should be foregone altogether—provided, of course, that some undertaking is given to take a supply for a definite period, or, in default, to pay a certain proportion of the cost incurred.

In this paper, however, I am more particularly concerned with the course to be taken and the arrangements to be made with regard to the extension of the business of gas supply in the heating and cooking department—a supply for illuminating purposes being already laid on. This subject is an interesting as well as important one; and I will deal with it under three heads—viz., advertising, educating the consumer, and affording facilities for fitting up of gas appliances.

In connection with the first point—advertising—there has lately been considerable improvement. Still, much remains to be done. To judge from the enormous outlay incurred in this department of trade alone by certain well-known caterers for the comfort and health of the public, there must be something substantial to be made out of judicious advertising. Certainly, the managers of gas undertakings have not erred as yet on the side of liberality in this respect. One of the best means of advertising is holding an exhibition of gas appliances. This up to the present time is a very popular way of practically demonstrating the many uses to which coal gas can be applied as a fuel, and showing the desirability of introducing this useful agent of heat and energy into the house and workshop, and of bringing these points well under the notice of the general public. Ocular demonstration is unequalled in the practical results which it usually brings forth.

I would, however, go farther. While to many minds the reply to the query "How shall we increase our business?" is "Advertise! Advertise!" the peculiar conditions of gas consumption are such as to justify the exhortation to "Educate! Educate!" as of equal, if not prior importance. In this matter, advertsing and educating the consumers should go together; and the means adopted with either object should answer the double purpose. Supplement the advertisement and instruction afforded by the ordinary gas exhibition by the circulation of literary matter which should set forth, in concise form, such information as may be of practical utility to the consumer. Hints should be given as to the adaptability of the various patterns of gas globes; the capabilities of the different kinds of illuminating, heating, and other burners, and of the several types of stoves; and the causes of the numerous difficulties and troubles encountered by the ordinary consumer, and their remedy. Tabulated statements of results obtained, and the attendant cost for gas, are useful as a guide and indication of what may be done by careful management. The various circumstances which are often so fruitful of waste, and consequent dissatisfaction, should be pointed out, with a view to their avoidance by the consumer. Information should also be given explanatory of the reading of the meter index—a simple matter, but one which is as perplexing to the many as it is simple to the initiated few. A pamphlet embodying these suggestions would be hailed with genuine pleasure by the bulk of gas consumers, and would also be instrumental in pushing the consumption of gas for the purposes under consideration.

A very practical and an important means of advertisement and instruction combined, is a permanent exhibition of gas appliances in or near the public offices of the undertaking. While it is unnecessary to keep a large stock of goods on hand, the assortment should be varied, and comprise all the most important of the useful appliances to be procured. I cannot agree with the plan—adopted with the best of motives by some managers—of the show room open to all and every manufacturer of gas stoves; as the result is often disastrous. Some makers take much pride in the decorative appearance of their appliances; but do not trouble to investigate to any great extent the theory of gas consumption. Consequently, the burners are cast, cut, or moulded to some approved pattern, or by rule-of-thumb, under the direction of some small ironmonger's foundry foreman; and when the stove is in use, the result is the giving off of offensive odors, arising from incomplete combustion of the gas. This may result from the faulty construction of the burner, the too near presence of some cold supporting bars, or other error of detail. The direct causes of the unpleasantness are manifold; the indirect one is invariably a want of care in the design and construction of the burners and stove—no attention being given to the illuminating power of the gas supplied in the district in which the stove is to be used, the areas of the gas nozzle, the gas and air outlets, the cubical contents, and length of the mixing chamber, etc. The remark as to the illuminating power of the gas only applies to gases abnormally below or above the usual 16 candle quality. Ordinary burners will not prove suitable for the cannel gas supplied in London, Glasgow, and elsewhere, or for a gas of less than 14 candle power.

For attainment of perfectly satisfactory results, these and many other matters must be carefully considered, even though the resultant conditions may be perfectly incompatible (which, as a rule, they are not) with artistic results. Decorative art is important, and may with great advantage be applied to drawing room, sitting-room, and bed-room fires, and other domestic appliances; but it should never be carried so far as to interfere in any way with the efficiency of the apparatus. I am afraid, however, that the attractive appearance of some makes of stoves is their sole recommendation to favor; and, worse still, the important matters I have alluded to are often ignored on the score of cheapness—this being the desideratum to a large class of makers. The general public do not make any pretence to be able to discriminate between the various patterns of stoves placed before them; and, as a rule, they would be chiefly guided by outward appearances. If such stoves are on exhibition in the gas works show room, they are considered to have the recommendation of the authorities. The status which, in the opinion of ordinary consumers, such a position thus confers is very considerable. The natural inference arrived at is that any stove thus recommended by, and to be obtained through, the gas undertaking must necessarily be satisfactory, and of the best type procurable. Any failure of apparatus thus obtained is therefore attributed to the system at large; and the whole class of apparatus is condemned. It is for this reason that great care should be exercised in the selection of the stoves to be exhibited, or even admitted therein; and bearing in mind the educational value, as regards gas matters, of these show rooms to the uninitiated consumer, it follows that no stoves which by practical experience and careful test, have not proved themselves thoroughly satisfactory and worthy of confidence should be allowed a place.

Then, again, respecting the show room itself. This should be fitted up in a pleasing and attractive style, and should be kept scrupulously clean; while every provision should be made for showing to the best advantage, and in practical working operation, the various appliances on exhibition. Above all, efficient means should be provided for thoroughly ventilating the room, and immediately removing all products of combustion arising from the burners. An illustration will show the importance of this. In the course of a conversation which took place between two friends some weeks ago, the subject of gas stoves for heating, cooking, etc., was brought up; the opportunity being taken by one of the gentlemen (a gas official) to enlarge upon their advantages from an economic and cleanly point of view. "Ah, yes," was the reply. "Very true; but how about the smell?" "Oh, under proper management, there is no smell whatever, particularly if you keep your stoves clean." "Well, then, why don't you manage it in your own show room? If *you* can't work your stoves without disagreeable smells, how can I expect to do so? All I know is that when my wife went down to the works the other day to select a stove, the smell in the show room was so bad that she was laid up for a day or two." For the truth of this I can vouch; the charge being a perfectly just one. The result is, as might be expected, a limited demand for stoves in a district which is peculiarly susceptible of development in this line of business. The mention of this incident will serve to bring into prominence the disadvantages under which a concern may be working when care is not taken respecting what may be termed the details of the trade.

An important suggestion bearing upon the matter of educating consumers, and one that has already, if I mistake not, been acted upon in the provinces, is the appointment of a special inspector whose duties consist in advising consumers on all matters connected with gas consumption. Such a man, if thoroughly competent, and equal in every respect to his position, would become invaluable to company and consumer alike. The matter is thus one that is well worthy of earnest consideration. The idea is fully enlarged upon in the article to which I have already referred.

Before leaving this part of the subject, I will allude to what, according to information I have recently received, is being done by one of the Metropolitan Gas Companies in order to push the trade in gas appliances—viz., the allowance of a commission to the district inspectors on all orders for stoves which they may be instrumental in obtaining. I have not the details of the scheme before me, but I understand that it has been carefully worked out, and is giving general satisfaction. While in a large undertaking it is often desirable to confine the operations of the several officers to their own departments, this is a case where the exception may prove the rule. Who should be better able to ingratiate himself and his company with the consumer than the district inspector? Numbers of the officers, taking an interest in the welfare of the undertaking they represent, would in many cases, if the rules under which they work did not forbid it, frequently add largely to the number of users of gas heating and cooking appliances by persevering canvassing and judicious inquires. Such interest ought to be encouraged; and this could surely be done without hurting in any way the susceptibilities of other officers, or interfering with their work.

With regard to the facilities to be offered for the introduction of appliances, nothing can be better than the hire system, with the option of purchase where desired. The hire-purchase system has been worked by many provincial companies for some years, and with considerable success. The surprising thing is that there are still so many companies who are holding aloof from an enterprise so promising from every point of view.

[To be continued.]

The Dangler Water-Back Gas Range.

We are indebted to the Dangler Stove and Manufacturing Company, of Cleveland, Ohio, for the accompanying illustration of their new and successful water-back gas range. As this is something new in the stove line, we think our readers will find profit in scanning it critically, in

that it is the only gas range or stove now on the market in which the water heating device is a part of the range itself, and so constructed as to furnish or afford a continuous supply of hot water, while the range is in action, for general household use. In fact, one of the defects that more than any other held back the advance of the gas range was the hot water difficulty; under the old style the apparatus for heating the water was supplied separately, which made the results far from economical, to say nothing of the inconvenience. In writing to us about it the Dangler folks say: "In view of the labor-saving and economical advantages of gas as a domestic fuel, these ranges and stoves are rapidly coming into general use, and we believe that the Dangler Stove and Manufacturing Company's improvement will be highly appreciated. Over 2,000 of these water-back ranges are employed by a like number of families in the United States, and are giving entire and perfect satisfaction. The device is covered by broad patents. Our ranges are marvels of convenience, and are substantial and durable, being made with cast iron tops and fronts, malleable doors, heavy nickel bases, and handsomely ornamented. They are made with ovens of ample capacity, and are also fitted up with radiating burners for roasting, broiling and toasting."

[Concluded from page 476.]

Some Applications of Electricity in Engineering Workshops.

By Mr. Charles F. Jenkins, B.A.

A traveling crane affords one of the most suitable opportunities for the application of electrical power, and the practical difficulties met with in the mechanical construction and gearing are very few. The most important point to bear in mind in designing the gearing is, that the motor should run continuously while the crane is being used, and not require to be stopped or reversed for any of the motions of the crane. This necessity introduces the only really important problem, namely, the design of a clutch, or some form of gearing which can be connected at will with the motor shaft. The difficulty of this would not be so great but for the fact that all three motions of the crane, viz., lifting, traveling and cross traveling have to be performed in both directions. The commonest form of gearing suitable for this purpose is, perhaps, the double conical friction gear, where the friction wheels are replaced by miter wheels, which are driven by a double friction clutch. The first of these methods is suitable for transmitting small powers, and can be used therefore for the traveling motions of the crane; but it is not suitable where more power has to be transmitted. The second method with miter wheels is suitable for moderate speeds, but does not work well running as fast as it is desirable to run the motor. There is, however, a point which must not be overlooked in the case of the hoisting and lowering motions, namely, that much power is required for only one of these, the hoisting, while a very little power indeed is sufficient for lowering. This makes the difficulty much less, for it is only necessary to arrange a single-action clutch to transmit the power required for hoisting, while a subsidiary arrangement may be made for the reverse motion. The only other point of importance is connected with the construction of the motor itself.

The load on the motor, when used for working a crane, varies enormously and very rapidly. It varies, in fact, from zero to the maximum, which may be considerably above the full working load, since it has only to be borne for a short time. And these extreme variations are continually occurring. This makes it of great importance to design the motor so that there shall be very little or no sparking at the commutator under extreme variations of load. Mechanical devices for shifting the brushes are not suitable, owing to the rapidity with which the variations occur.

The crane, however, which is about to be described was not originally designed to be driven electrically, but by means of a fly rope. The crane spans 38 feet, and travels 100 yards, and is constructed to lift 10 tons. In applying electrical power to this crane it was thought advisable to arrange it so that it could be replaced by the rope driving with as little delay as possible in case of any failure.

This was done in a very simple manner. The long fly-rope was replaced by a short piece on the crane itself. The path of this piece was the same as that of the old one, only that, instead of passing round the two wheels at the end of the shop, it passed round two 18-inch wheels on the crane, one being on the motor spindle, the other on a straining carriage. Thus the gearing was all left unaltered, and by merely substituting the long rope for a short one, the crane could be driven as before, in case of breakdown. The crane has, however, now been in daily use for six months, and this has never had to be done since the first day the short rope was put on.

Great diversity of opinion was expressed as to the power required to drive the crane, and no very reliable information could be obtained. Before making the motor the author attempted to measure the power

transmitted by the rope by measuring the strain on the tight side of it, also by attempting to determine the load on the steam engine which drove the rope; but on account of irregularities of speed this was found impracticable.

The advice of the foreman of the millwright was therefore taken, and a 10-horse power motor of the Manchester type was constructed and fixed on the crane.

In order to avoid sparking a pair of small series-wound magnets were placed on opposite sides of the armature, so that their poles were on a horizontal diameter, and were over the section being short circuited by the brushes. It was found to answer admirably, and entirely prevented sparking, no matter how quickly the load was applied.

It was determined to work with 150 volts, this being thought the maximum which could be used without danger to the man in charge. The current is conveyed to the crane through two steel angle bars, 1¾ inch by $\frac{5}{16}$ inch, which run all down the shop, and are supported, two feet apart, under two wooden planks. The lengths of angle bar are connected by U-shaped copper strips, fixed onto them by means of two ¼-inch set screws. This allows for the expansion and contraction of the iron. This method of support was adopted in order to avoid, as far as possible, accidental short circuiting by tools or other objects laid between the conductors, and also to make it very unlikely for any one, working on or about the crane, to receive shocks through touching both conductors at once. The wooden plank also keeps the dust off the rubbing surface.

The outer face of the angle bar was ground to remove the scale, and given a coat of vaseline to prevent rust. The connection to the motor is made through two sliding contacts. Each contact consists of three brass slippers on a spindle, which works in a short slot, each pressed forward by a small flat spring. This allows each slipper to bed itself flatly on the angle-bar instead of touching along one edge. The spindles are fixed on to two wooden arms hinged on the crane, the hinge allowing of both vertical and horizontal motion. Under each slipper a short steel guide projects, which slips along the under edge of the angle-bar. The arm is pressed forward and upwards by means of two springs, and so follows the irregularities in the angle-bar. The strength of the spring on the arm is adjusted to keep the springs in the slippers about half compressed. These contacts do not spark, and have given no trouble what ever. The brass pieces can be replaced at a very trifling cost when they wear out, but what their life will be is not yet known.

A double interlocking switch is arranged for starting the motor. The two contacts are so connected that the one must be made before the other and broken after it. This is in order to insure that the magnet circuit shall be made before the armature circuit and broken after it.

As an additional safeguard the connections were made in a way which makes it impossible to complete the armature circuit without the magnet circuit. This device consists in sending both circuits through the first switch, and the armature circuit alone through the second switch. In order to start gradually a variable water resistance was inserted in the armature circuit, which is cut out when the motor attains its full speed, and to avoid sparking on breaking the magnet circuit a second small water resistance was arranged as a shunt to the switch. Both switches were arranged so that one movement of a lever first made contact through the water, then reduced the water resistance, and finally cut it out by a metal contact.

As soon as the new method of driving was fitted up, experiments were made to find the power required for the different motions. The power was obtained at once from the observed electric power supplied to the motor and its known efficiency. The power required to drive the short length of rope and the four belts on the crane was 2.85 horse power.

To lift 8 tons at about 4 feet per minute, 6.5-H.P. additional.

To lift 4 tons at about 9 feet per minute, 7.0 additional H.P.

The cross-traversing at 27 feet per minute, about 0.6-H.P.

The long-traversing at 47 feet per minute, less than 1-H.P.

The motor was also arranged to drive the old fly-rope, the power required being 13-H.P.

The total power absorbed by the motor when lifting 8 tons is thus shown to be 11.1-H.P.

The total power required by the fly-rope on the same load is 19.5-H.P.

Thus there is a saving of 8.4-H.P., or 43 per cent.

Since it is desirable to remove the rope altogether, experiments were made on various forms of gearing. The conical friction gearing already described was tried, but it proved unfit to transmit sufficient power.

The miter wheels were also tried, running at 1,100 revolutions, but they made such a deafening noise that they were abandoned.

Another form of friction gear was tried, but it failed also.

After the failure of these experiments, Mr. Webb suggested to the author the use of a magnetic clutch. In order to test its suitability one was made and tried, running at about 1,000 revolutions, and transmitted 8 H.P. satisfactorily, stopping and starting perfectly.

In conclusion, the author expresses his thanks to Mr. Webb for his kindness in affording him every facility for carrying out his experiments, a few of which have been described in this paper.

[Read at the New York Meeting of the American Institute of Mining Engineers.]

Explosions from Unknown Causes.

By Mr. J. C. Bayles.

Mr. Bayles said that three accidents, the cause of which had not as yet been explained, had come under his notice in one establishment. The first of these curious occurrences was the bursting of a 16-inch pipe carrying air under a compression of about one pound. The pipe was made of light galvanized iron with soldered seams. Into it a rotary fan blower delivered air, and from it smaller pipes were carried to the furnaces. The blower was run continuously. Neither the main pipe nor its branches had any connection with the gas conduits. Both air and gas pipes delivered into the furnaces; but although the gas was under much higher compression than the air, there appeared to be no good reason why, having free escape in case of leakage, it should ever make its way back into the air pipe. One warm afternoon in June the main air pipe exploded with great violence. Every window in the mill was blown out, a considerable section of the roof was raised an inch or two, and in several places it was blown through. The pipe was torn into a thousand pieces, and a wagon load of fragments not larger than his hand were scattered all over the mill. Several of these fragments were driven edgewise into the roof timbers. The disc closing the end of the pipe was projected against a brick wall with such violence that it remained fastened in place, and is there yet, a mural tablet commemorating the event.

The pipe in which the explosion occurred extended the whole length of the mill. The machines then in use were placed together near the end connected with a blower, leaving some 80 feet of what may be called dead end. It was in this dead end that the explosion occurred. The portion of the pipe from which outlets were taken was substantially uninjured, but 75 feet of the 80 feet beyond the furthest outlet were utterly destroyed. The fact that with very little mending the part of the pipe which the explosion had not reached continued for some months to supply the machines with air shows how local the explosion was, and the damage to the mill building gave sufficient evidence of its violence.

The natural explanation of this explosion is that gas found its way into the air pipe and was packed away in the dead end, and that when mixed with air in explosive proportions it reached a furnace and exploded. He could only say that the most rigid investigation failed to explain how the gas got into the air pipe against the pressure it carried, and why an explosion beginning at a furnace should have restricted its effects to the dead end of the air pipe. It was undoubtedly a gas or vapor explosion, but he could find no other explanation of the presence of gas or vapor than that it was formed by the volatilization of the oil consumed in lubricating the trunnions of the blower. It is conceivable that the large amount of oil consumed by the blower is volatilized, and that it becomes a hydrocarbon gas, which would behave like any other gas of similar composition. This gas, being lighter than air, would occupy the upper part of the pipe and remain undisturbed while air was drawn from outlets taken from its under side. This light gas may have worked along and accumulated in the dead end of the air pipe until it reached, in admixture with the air, the explosive condition. But whence the spark? And why, if fired by a furnace, was the destructive force of the explosion exerted so far from the point of ignition? This hypothesis assumes that the volatilized or gasified oil of many days' running would remain undiffused for as many nights, until its accumulated volume was great enough to explain the phenomena of the subsequent explosion. The best that can be said of it is that perhaps it is better than no theory at all.

Nothing similar has occurred since. The galvanized iron pipe was replaced with a 16-inch steel tube, 400 feet long, to meet the increased requirements of the establishment. All the other conditions remain the same, except that a small opening was left in the end of the pipe which cannot be wholly closed. Whether this is necessary is not known.

The second of the curious accidents I shall mention was the explosion of a No. 6 Sturtevant blower. I was a witness of this amusing, though somewhat alarming occurrence, and can speak of it from personal knowledge. The blower was inside the mill, and was driven by two

belts from pulleys on the main line of shafting. It was used to furnish blast for the gas generators. Some trouble with the main driving belt necessitated a stoppage of the mill engine, and the blower stopped. In a few minutes the engine started again, and with it the blower. It had been long in use, but as this was its first day of service in that position I was naturally curious to see how it worked. So I stood watching it. Suddenly it disappeared. One side passed close to me and lodged against a post. Fragments weighing 20 to 50 pounds were distributed in all directions. The explosion was accompanied by a violent report and succeeded by a dense cloud of yellow-brown offensive smelling smoke, which rose to the roof, rolled right and left, and finally escaped at the monitor.

Again I investigated, until there remained no questions to ask. That it was not a centrifugal rupture I knew without being told. The conclusion was that during the stoppage of the engine some air gas from the producers had worked back through the pipe into the blower. When the blast was resumed these products of imperfect combustion were carried with the air current into the producers, and being mingled in explosive proportions had been fired by contact with the incandescent fuel and exploded. This explanation was never quite satisfactory to me.

[Mr. Bayles then explained the connections between the producer and the blower, and said that the pipes, some of which were light and some heavy, were undisturbed, even the delivery pipe of the blower remaining coupled to the length of pipe on the mill floor.]

The third of the series of unexplained accidents consisted of two explosions following one another so closely, and under conditions so nearly identical, that they may be considered as one episode. In the purification of gas we use purifying boxes of the usual pattern. We have four boxes so connected by the center seal that we can throw any one of the four out of use when it is necessary to clean it. The gas always passes through three boxes before reaching the gasometer, and one is always kept ready to be filled with fresh iron and brought into use when needed. When the gas shows the presence of impurities or diluents it is time for a change.

One day the superintendent and manager had occasion to go into the purifier house together, and while there the superintendent tried the gas. Getting a reaction indicating the presence of impurities, and finding the idle box ready, he turned the center seal, cutting out the box which had been the first to receive the gas, and making the clean box the last of the series.

The cap of the outlet was left off for the escape of the air, and not screwed on until there was a strong smell of gas, indicating that the air had been expelled. The same thing had been done in the same way hundreds of times. In two or three minutes the third box exploded with great violence. The cover was wrenched loose from the four clamps holding it down, carried up through timbers and roof, and dropped again, badly wrecked. The center seal was canted to one side, allowing a copious escape of gas. The building took fire, and a second explosion in the basement blew out about half the foundations. The second explosion was easily understood. Fortunately, fire extinguishers and hydraulic jacks saved the building, and except the need of repairing the broken box the damage was slight. I at once began an investigation, which has lasted ever since. The explosion was undoubtedly due to the ignition of a mixture of gas and air in the box; but how was it ignited? The gas, before reaching the box in which the explosion occurred, had passed through the hydraulic main, two scrubbers, more than 500 feet of unjacketed pipe, and two purifying boxes, each containing three layers of wet sesquioxide of iron. It requires a violent stretch of the imagination to believe that a spark could travel so far under conditions so adverse. The pipe which delivers gas to the boxes is rarely quite cold, but I have never found it more than warm. The tops of the boxes are always cold, and the gas enters the gasometer at atmospheric temperature. While we were speculating as to the cause of this accident, and congratulating ourselves that it was never likely to happen again, another box, the third of the series in use, exploded under exactly similar conditions. A detailed account of one explosion describes the other perfectly.

Matters were getting serious. I must find out what was wrong and correct it. So I called in all the experts I could reach. Some were honest enough, after looking the plant over, to confess that they had no explanation to offer. Others gave reasons which would have been satisfactory had they not been at variance with the facts. For the information of those who may be disposed to speculate as to why these boxes exploded, I may say:

1. The hydraulic main is modeled after the best gas works practice.
2. The scrubbers are adequately supplied with water.
3. The iron in the boxes which exploded was found, on analysis, to contain less than 9 per cent. free sulphur, and is still in use.
4. The iron was adequately revived before being replaced, and did not heat in the boxes. After the explosions it was found to be cold.
5. The iron was found to be sufficiently wet.
6. There was no fire in the purifier house and "no smoking."

Since these two explosions, which occurred in April last, we have had no trouble. There has been no change in the arrangement of the gas plant, for we can discover no way to improve it.

Wood Gas in Bavaria.

Some weeks ago, says the *Gas World*, Dr. N. H. Schilling gave a sketch of the history of gas making in Bavaria, which presents several points of interest. From this we quote, abridging greatly as we go, some notes concerning the early history of wood gas.

Dr. Pettenkofer, professor and academician of Munich, brought forward wood gas and lectured on it, 28th January, 1850, at a monthly meeting of the Polytechnic Institution in Munich. The original idea was—there is much discussion all around as to whether Munich shall have coal gas; on sanitary grounds we have our apprehensions; we would have no such fear of the French resin gas, but why make resin gas from resin when we have so much resinous wood all round Munich? Let us make wood gas direct. The results were bad—5 cubic feet of poorly-lighting gas from a pound of resinous wood. Then Pettenkofer lighted upon a new principle in dry distillation not previously applied; the result was 30 to 40 per cent. more gas and a lighting power equal to that of the coal gas of the period (11 candles). The principle was (Royal Bavarian Academy of Science, 4th May, 1857, Pettenkofer) that gas given off at a comparatively low temperature (boiling point of mercury: CO_2=54.5; CO=33.8; CH_4=6.6; heavy hydrocarbons, none) became, if more highly heated, greater in bulk, and decompositions occurred under which heavy hydrocarbons appeared (CO_2=18 to 25; CO=40 to 50; CH_4=8 to 12; H=14 to 17; hydrocarbons=6 to 7). The large quantity of carbonic acid gave trouble in purification, and the apertures in the burners had to be made considerably wider than those in coal gas burners.

Then came difficulties in getting practical help in working out a process which was to compete with coal gas; but these were overcome. Then came investigations and reports by learned societies. The wood gas was reported to give 10 per cent. more light than the coal gas; and as to statistics, the following is an illustrative sample (Nov., 1851):

Retort charge, 100 lbs.	Retort charge, 150 lbs.
Time, 1½ hours.	Time, 4 hours.
Gas, 650 Bav. cu. ft. (of which 5½ = 4½ English cu. ft.).	Gas, 765 Bav. cu. ft.
Per hour, 432 cu. ft.	Per hour, 167 cu. ft.
Per 24 hours, 10,000 cu. ft.	Per 24 hours, 4,000 cu. ft.

Reckoning the Munich demand at 12,000,000 cubic feet per annum, or 32,874 daily average, for this there would be required—

About 50 cwt. wood, at 20 kr. =16 fl. 40 kr.	About 64 cwt. coal, at 1 fl. 15 kr. =80 fl.
Fuel (peat) = 15 fl. 21 kr. daily.	The fuel costs nothing extra, being the coke produced.
Gross daily cost, 32 fl. 1 kr.	Gross daily cost, 80 fl. — kr.
Less receipts for charcoal..... 13.30 kr.	Receipts for surplus coke.... 10.24 kr.
18.31 kr.	69.36 kr.
1,000 cu. ft. cost 34 kr.	1,000 cu. ft. cost 126 kr.
Retorts survive 4,000,000 cu. ft. each.	Retorts survive 10,000 cu. ft.

The wood gasworks at the Munich railway station became the center of a great deal of inquiry, and the practical question emerged—should not the coal gasworks in Nurnberg, Augsberg, and Munich adopt the wood gas? Lively controversies followed; but in these towns nothing happened, except delay in the progress of coal gas. In some other places—Heilbroun, Basel, Bayreuth, Pfrozheim, and Drontheim—wood gasworks were set up, and Heilbroun was first lit by wood gas in December 1852. Troubles again; lighting power very low; reason discovered, gas passing over instead of through milk of lime, going on in consequence with 20 per cent. of carbonic acid in it, most detrimental to lighting power. This was got over, and a Government commission reported very favorably on wood gas. In Basel the silk makers favored it because they apprehended evil consequences from the sulphur of coal gas. The largest works was at Bayreuth—a 4½ English cubic feet flame was to give 7-candle light, and the price was from 4½ to 6½ florins per thousand Bavarian cubic feet (=857 English cubic feet); the duration

of the treaty for 36 years: works opened 1st May 1853: wood gas supply went on till 7th April 1864, when gas from Zwickau coal was introduced in its place.

The next place into which wood gas was introduced was Wurzburg; the works, planned for 5,000 to 5,500 burners, was opened 8th July 1855: it contained 5 furnaces with 3 retorts each, 200 feet condenser 8 inches wide, the scrubber 3 feet diameter, and 70 cubic feet content, 2 Archimedian-screw exhausters, 2 washers, 4 purifiers with 500 square feet surface each, 2 gasholders 33,000 cubic feet each, and 75,000 feet pipes. The light proved to be one-sixth better than the light in Bayreuth, and gave great satisfaction.

In December 1865 coal gas was introduced in Bamberg; in 1857 wood gas in Kempton and Regensburg (Ratisbon), coal gas in Schweinfurt, where there had been a private gas works which had lit an apothecary's premises, and one street lamp since the year 1817, and which from the year 1819, had lighted 15 public lamps; and coal gas in Furth in 1858.

Passau introduced wood gas in 1860, but by this time various towns were finding that wood gasmaking was increasing in expensiveness, and, in some towns, such as Erlangen and Bayreuth, it was given up.

Covering Pipes and Reservoirs for the Conservation of Heat.

A writer in *The Builder*, in the course of a series of articles on "Hot Water Supply," says there is no branch subject in connection with hot water works deserving so much attention as that which forms the heading to this chapter. It is no exaggeration to say that very shortly no apparatus for hot water supply will be considered complete or finished if the whole system is not insulated, so to speak, so that almost every particle of heat absorbed by the water in the boiler will be obtainable from the taps, instead of nearly 50 per cent. of it being radiated from exposed surfaces, and worse than wasted.

There are at this moment hundreds, if not thousands, of hot-water systems that, by being carefully covered, would be converted from miserably inefficient to highly satisfactory appliances,—this in particular with the tank system, when the tank is so commonly fixed in a cold, draughty roof.

An interesting instance of the success attending the covering of pipes occured quite recently, in which a residence was fitted with a complete system of hot-water supply pipes on a scale sufficiently large for a good boiler in a 5 ft. kitchen range, but owing to a delay experienced in obtaining the range in question, another of a smaller size, 3 ft., was fitted up and connected to the chimney and circulating pipes for temporary cooking and hot water supply. It was not supposed that this little range with its boiler would do much in the way of water heating, but to the astonishment of everyone it gave a really abundant supply of very hot water in every part of the house as quickly in the morning and altogether as satisfactorily as a larger range would be expected to do.

This desirable result was wholly brought about by the pipes and cylinder being everywhere carefully covered with a sufficient thickness of felt, so that however hot the water was within the pipes, no heat could be felt outside the covering, a sure indication that no heat was being dissipated.

It really does seem opposed to all reasonable and workmanlike principles to allow such abundant opportunity for heat to be thrown away, while labor and fuel is being expended in the kitchen apparently for this object. If a fitter or maker of steam engines and appliances did not attend to the subject of this paper in a thorough aud workmanlike manner he would be considered to have hardly mastered the rudiments of his business. The waste of heat is not always the only ill result experienced, as in many instances the warmed air is very objectionable, and if a hot-water pipe is carried alongside a soil pipe it is posssible for a very unpleasant feature to introduce itself. It is a very customary practice for a hot-water fitter to carry his pipes up in the casing that is nearly always to be found passing from the bottom to the top of the house, this casing containing all the different pipes of the house, such as the cold service from the main, the cold service down from cistern, the w.-c. cold-water services, and, very commonly, the soil pipe. There is no objection to his making use of this casing if it is large enough to hold a few more pipes, and it is often used of necessity, as to carry pipes openly through well-decorated rooms is out of the question; but to carry hot water pipes up this case without felting them is an exceedingly bad practice, as they are not only brought into contact with very cold surfaces (they have frequently been found wired on to cold pipes, four or five pipes in a bundle), but the heat radiated causes a draught or current of air to set in, as we find in a chimney.

When a casing contains pipes that radiate heat, that casing, within a few moments after the heat is felt within it, is converted into a flue, as by applying heat to air it can be made to circulate to all intents and purposes like water. Air that is brought in contact with heated surfaces becomes heated and rarefied, and, being thus made lighter than the surrounding air, rises, and cold particles immediately flow in to take its place, they becoming heated and following the first particles, and so on, so that it resolves itself into a stream of warm air flowing out of the upper part of the casing, and cold air flowing in in corresponding volume below. This may be excellent in practice when hot water pipes are used for effecting ventilation; but it is fatal to hot water services which are particularly required to keep the heat within them; in many instances they are cooled at about the same speed as they would be if placed outdoors when a strong wind was blowing.

It may be argued that if the casing is stopped off at its two extremities the trouble will be obviated; and so it would be if the casing was *perfectly* air-tight everywhere, and had no cold pipes within it. But this is never the case; there are always numbers of crevices and apertures which permit of a tolerably free ingress and egress of air.

The best material for covering these pipes and also the reservoirs is hair-felt; hair is a natural poor conductor of heat, and nothing surpasses it for this purpose, especially as it is so easy of application. This felt, which is readily obtainable in sheets, is usually cut up in strips for pipe work; the strips are wound upon the pipe spirally, being secured here and there with cord or wire, but where spiral winding is impossible it can be tied on in lengths, which answers equally well but has not such a good appearance.

The best and most complete arrangement for pipe work, but which entails a little greater expense, is to have the felt wound on spirally in one direction, say from left to right, and well secured with cord; then cover this with good canvas, also wound on, but in the opposite direction, and this secured with wire.

It is most necessary, to secure the best results, to have the felt thick enough; hair-felt is sold in great quantities about $\frac{3}{16}$-inch thick, but this is not thick enough for good work. If possible, have it $\frac{1}{2}$-inch thick, and a marked benefit will be had by using even thicker than this, or, say, two thicknesses of $\frac{3}{4}$-inch.

In felting cylinders, it is the best plan to take sufficient sheets of felt, and then sew the edges together to form one sheet large enough to go all round the reservoir. This sheet can then best be secured by bands of hoop iron or brass passed round at top and bottom, and around the middle; these bands being tightened up by having a bolt to draw the two ends together. After this circular pieces can be cut for top and bottom, these pieces being sewed on to the top and bottom edges of the large sheet. Tanks can be covered in exactly the same way.

Sometimes it is desired to encase the tank or cylinder with woodwork. This makes by far the neatest job, though more expensive, and it causes a little trouble should it be necessary to open the reservoir under some circumstances. If it is decided to have a casing it is very important that the space between the woodwork and the reservoir be well filled in with some poor conductor of heat, such as cow hair (plasterers' hair), slag wool, or even dry sawdust answers very well when the casing can be filled from the top. If the casing is not "packed" with something it would be much better to be without it, as it would have a current of cold air passing up through it the same as explained with the general pipe casing just referred to.

If the hot water service pipes are carried up through the house without entering the general pipe casing mentioned, and it is proposed to encase them for the sake of appearance, this casing must also be packed for the reasons explained, but this is frequently neglected with the worst results, as the casing of pipes is frequently done for appearance sake only, the question of radiation not being considered.

Occasionally it is found practically impossible to carry the pipes up inside the house, in which case it becomes necessary to carry them outside. This is very objectionable, but where it cannot possibly be avoided the objections do not avail, but they must be guarded against. In the first place, the pipes *must* be encased, and the casing ought to be of fair size, so that 1½ inch of packing can be filled in between the woodwork and any of the pipes. The packing must fill the case tightly, and it is imperative that the casing be well and tightly secured to the wall, as, should it get loose, the woodwork and the packing will come away from the pipes and leave them exposed.

When pipes are carried outside, the packing is not only needed to prevent great waste of heat, but there is a danger to be guarded against in cold weather when the pipes are liable to be frozen and an explosion possibly ensue, as the only outlet for any steam that may be generated in the boiler is at the upper extremity of the expansion pipe, unless a safety-valve is provided.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. H. D. FITCH, of Louisville, Ky., has sold the Jeffersonville (Ind.) gas plant to the proprietors of the local Electric Light Company, at a figure nearly double that paid by him for the property about a twelve-month ago. The price paid was $45,000 cash, with all book accounts and cash on hand, on the first inst., these latter considerations bringing the actual purchase money close on to $50,000. When the city awarded the contracts for public lighting, etc., to the Electric Light Company, which action was taken about a year ago, the stockholders in the Gas Company, becoming greatly alarmed over the outlook, sold their works and franchise to Mr. Fitch, the sum paid being $28,475. Mr. H. T. Gerould was at once placed in charge of the works, and the new proprietor and his Superintendent at once inaugurated a determined attack on the electricians' holdings. As a result the latter lost ground rapidly, particularly in respect to their incandescent lighting supply, and the outcome is now shown to be that, to save themselves, the Gas Company had to be "absorbed"—Mr. Fitch did not want the electric plant. This termination, while undoubtedly an expensive one to the electricians, and unsatisfactory, too, in that some time ago they loudly boasted they would eventually "buy out the Gas Company at 50 cents on the dollar," shows how much good and cheap gas has to fear from a contest that involves the favor of the public, in respect to their choice of a lighting agent.

THE Mayor of Chicago has again turned his attention to ordinance making, as shown by the following, which is the essential portion of a recommendation made by him to City Councils, at a meeting held at the close of last month—the recommendation was referred to a committee: "No ordinance shall be granted by the City Council authorizing the construction and operation of any underground, surface or elevated railway, the laying of gas, water, or other pipes, electric conduits or wires, pneumatic tubes, tunnels, or any other work of any kind or nature, or for any other purposes whatever, on or through any street, avenue, alley, or other public highway in the city of Chicago, except upon the express condition that the corporation, company, firm, or individual, owning or to operate the same, shall be required by ordinance to pay into the city treasury of the city of Chicago at least 5 per centum per annum of the gross earnings or revenue accruing from the operation of such work or plants during the term for which said ordinance may be granted, in addition to any license which is now or may hereafter be imposed by ordinance."

THE Welsbach Gas Appliance Company, of Toledo, Ohio, has been incorporated, with a capital stock of $100,000.

THE Equitable Gas Light Company, of Memphis, Tenn., has placed 200 new street gas lamps, of handsome design, over the thoroughfares of that city.

IN final mention of the mandamus suit brought by Mr. B. F. Hallack, of Denver, Col., against the Denver Gas Company to compel the Company to furnish him with gas in any quantity desired by him, or as he might need it—which would virtually only be when the electric light used in his house was not to be depended upon—at the same prices at which other people were served by the Company; but who did not use electricity at all for illuminating purposes, was denied by Judge Allen.

A CAREFUL estimator puts the number of gas burners in use in the city of Springfield, Mass., at 150,000.

THE new schedule of gas rates that became operative in Milford, Mass., on the 1st inst., is as follows: Ordinary consumers, $2 per 1,000; monthly bills amounting to $5, 5 per cent.; to $10, 10 per cent., and 15 per cent. on all monthly bills amounting to $50.

A FEATURE of the New York meeting of the British Iron and Steel Institute was the visit of the members to the works of the Consolidated Gas Company. They were especially interested in the method of water gas manufacture.

SOME of the wiseacres in Boston who have been insisting that the works of the Pintsch Compressed Gas Company, erected in that city for the purpose of supplying gas to the passenger cars of the Old Colony and Boston and Albany Railroads, are a menace to the people of the city, recently applied to the Board of Fire Commissioners for replies to the following questions: "Have you investigated this factory?" "If so, is it dangerous?" The answers returned are: "When the Pintsch Company petitioned the Board of Aldermen for a license to manufacture and store petroleum and its product, the petition was as usual referred to us. In turn we referred it to District Chief Reagan, who recommended that a license be granted. About this time the *Bostonian* made some comments upon the place, and, as some Boston daily reprinted the article, it came to our notice; of our own volition the members of the Board made a personal examination of the premises. It is dangerous in one sense, as all manufacture of naphtha is dangerous. Still, its manufacture there is conducted in so safe a way that the Board recommended the granting of a license to the Company. Everything is in apple-pie order, and every precaution that can be taken has been taken by the Company. The gas is manufactured in a substantial iron-roofed building, and stored in a receptacle 10 feet underground, lined with an 8-inch brick wall. On the side nearest the closest building is a sheet iron screen extending up above the building, with an air space between it and the building. In view of these and other precautions the Board could see no reason for refusing to recommend the license."

THE Ukiah (Cal.) Electric Light, Water and Power Company has been incorporated to establish a plant at Ukiah, Mendocino county. Directors, Frank Enoch, William Hoffschneider, W. H. H. Graves and Jas. M. Haven, of Oakland, and N. W. Griswold, Charles Traubner and H. Gustav Trautner, of San Francisco. Capital stock, $50,000, of which $3,800 has been subscribed.

THE Newport (R. I.) Company is now distributing a gas which is composed of 3 parts of coal gas and 1 part water gas. The mixture is giving good satisfaction both to the producers and the consumers.

A CORPORATION to be known as the Bath (Me.) Gas and Electric Company, to operate the gas and electric lighting enterprises at Bath, has been organized at Portland, Me., with a capital stock of $25,000. The offiers are: President, Galen C. Moses, Bath, Me.; Treasurer, Fritz H. Twitchell, Bath. Certificate was approved September 26, last.

THE Bakersfield (Cal.) Gas and Electric Light Company, which is under the management of Mr. L. P. St. Clair, has just installed an electric plant of the Brush arc type. The Company is moving steadily forward.

THE plant of the Baton Rouge (La.) Electric Light Company was sold at auction a fortnight ago, the purchase money to remain a first lien on the property for twelve months. Mr. R. H. Burk secured the award, at the figure of $22,050—about one-third of its original cost. It is understood that Burk represents a syndicate of the old shareholders.

THE following interesting correspondence, between the Mayor of Des Moines, Ia., and manager E. G. Pratt, of the Capital City Gas Company, contains many hints of value to gas men. It was all brought about by a veto that had been made of certain propositions adopted in Council. The letter is: Hon. J. H. Campbell, Mayor—Dear Sir: I have been somewhat interested and surprised at the tone in which you expressed yourself in your veto, as it appeared in this morning's *Register*, relative to a gas lamp asked for an alley on Sixth street between Walnut and Locust streets, in which you take occasion to combat the Gas Company for something that is entirely outside of their control. In this veto you state that the Gas Company guaranteed to give a light from one arc lamp equivalent to six gas lamps which it displaced when the arc light at the corner of Sixth and Walnut streets was placed. It is certain that before writing this veto, or rather before any reference was made to the Gas Company, you did not make yourself familiar with the ordinances found on page 440 of the Revised Ordinances, 1888. If you will kindly read section 2 and section 6 of the ordinances you will see that the matter of placing arc lamps and dropping gas lamps was not left entirely in our hands, but to a committee of the City Council; in other words, we agreed to place 25 arc lamps and displacing thereby as many gas lamps as in the judgment of the committee was proper. This we did, and if the committee indicated that gas lamps should be removed from this point or that there certainly remained nothing for us to do but comply with their request and which during my administration has always been done. I cannot quite understand your notion when, because a citizen or citizens petition to have a street lamp at a certain point, that you take occasion to publicly criticise the Gas Company for service not rendered. Our arc lamps are certainly giving all the light that it is possible for an arc lamp to give, and if their rays do not reach far enough to light certain portions of certain streets it certainly is not our fault, and I hardly think that we ought to be subjected to the criticism referred to. We are certainly endeavoring to give as near perfect service in our street lighting as possible, and while we realize that under certain conditions and circumstances over which for the short time being we had no control

that we fall short of that perfection for which we are striving, I believe the service rendered the city by this Company is the equal if not better than that for any city in the West. I am willing to have our lighting service criticised when there is any need for it, and no one would be more willing to remedy a defect than I would. I think upon further investigation of this matter that you will find that you are wrong in using your veto to criticise the service rendered by this Company. Yours Truly, Ed. G. Pratt, Manager." Section 2 of the ordinance referred to by Mr. Pratt, after providing for the price to be paid for arc lights ($11.75 per lamp per month), says: "And the Company expressly guarantee upon the acceptance of the provisions of this ordinance that the erecting and maintenance of said 25 arc lights as provided, etc., shall not be of any greater expense to the city of Des Moines than said city is now required to pay the Company for lighting the same territory by gas, and that said lighting shall be equal in extent to the gas lights discontinued, and as satisfactory to the Council." Section 6 reads: "It shall be the duty of the Company, etc., to discontinue such lamps within any block or blocks where there shall be electric lights, as may be determined by order of the City Council, or its proper committee so ordered. * * * And said city shall not be held liable for the gas posts, lamps or lights so discontinued, or for any expense connected with removing the same."

MR. WAIT HATCH DAVIS, of Rochester, N. Y., died at his home in that city on the morning of September 28th. He had been prominently identified with the Rochester Gas Company, as a shareholder.

A RELIC of the times of Mrs. Dr. Sawtelle and the Avery Gas Company, of Los Angeles, Cal., comes to us in the shape of a suit instituted by W. H. Burbage against the Avery Gas Company, to recover the sum of $1,911.35, loaned to defendant on March 26, 1889, by J. G. Adamson, and assigned by the latter to plaintiff. The concern is bankrupt, for our correspondent gravely asserts that "Mrs. Dr. Sawtelle is all that is left of the Avery Gas Company." Poor assets, those, we fear.

ANOTHER change has come over the scene at Port Jervis, N. Y., the latest respecting the situation there being that Mr. J. J. Dillon, who for so many years has been identified with the *Orange County Farmer*, has purchased the lease of the Port Jervis Gas Light Company from Mr. W. E. Fullagar, the latter having taken the same on the 1st of September. Mr. Fullagar will remain as Superintendent, and Mr. Dillon will make important improvements on the works, mains, etc.

MR. WILLIAM PALMER, formerly in charge of the Clinch Valley (Va.) railroad extension, has been named to superintend the properties of the Roanoke (Va.) Water and Light Company.

MR. CLIFTON BOSLEY will, on the 18th inst., take formal possession of the superintendency of the works of the Annapolis (Md.) Gas Light Company, the transfer of which to new proprietors was chronicled by us some weeks ago.

MR. W. E. BARROWS, President and General Manager of the Welsbach Incandescent Gas Light Company, under date of September 30, caused the following circular to be published:

"*The Gas Appliance Exchange.*—Under the general management of the Welsbach Incandescent Gas Light Company, Gas Appliance Exchanges are being opened, in Philadelphia, at No. 22 South Fifteenth street; in New York, at No. 71 University place; and in Boston, at No. 134 Congress street. The object of these Exchanges is to bring to the attention of gas consumers, with a minimum of trouble to the consumer and of expense to the manufacturer, all devices now on the market depending in their operation on fuel or illuminating gas. The Exchanges undertake to put the goods on exhibition, explaining to visitors the claims made by each manufacturer for the article exhibited, and distributing printed matter that is furnished; referring inquirers to the nearest agent where the goods are kept in stock. Sales to dealers, as well as individual consumers, will be made by the Exchange if that is the desire of the exhibitor; a uniform rate of discount to be allowed on each class of goods, should the Exchange act as selling agent; the Exchange agreeing to maintain the prices established by the exhibitor. We will endeavor to make these Exchanges headquarters for resident and visiting gas men. The charge for floor space occupied is $2.50 per square foot per year, payable monthly; but no exhibit will be made for less than $1 a month; wall space and drop lights to be charged as agreed upon; but no single article will be thus exhibited for less than $6 a year, payable in advance. Exhibitors desirous of showing their stoves, engines, burners, etc., in operation, will be expected to pay for the gas so consumed. Actual cost of connections, freight, handling, etc., will be charged to the exhibitor. Exhibitors will be expected to make their headquarters at the Exchange when in town; the management undertaking to conduct the business of the Exchange in the interest of all exhibitors." This idea seems to us to be both novel and good.

THE Gearing Fuel Gas Company, of Bellaire, Ohio, has organized by selecting the following Board of Directors: J. M. Maring, Jas. Dubois, G. W. Yost, D. J. Smith, A. W. Voeghtly, John T. Adams and Jas. C. Tallman.

THE inclined benches at the Laclede Gas Company's works are being operated with excellent success. The start was made on the 3d inst.

AT the annual meeting of the Mansfield (Ohio) Gas Company the following officers were chosen: President, L. A. Strong; Secretary, W. C. Hedges; Superintendent, Geo. S. Harris. The only difference in the executive management of the Mansfield Electric Light Company from that of the Gas Company is that Mr. S. E. Bird is its President. Both departments of the business yielded very satisfactory returns.

THE Goodwin Gas Stove and Meter Company completed recently an entire set of gas cooking apparatus to the order of the proprietors of the West Hotel, Minneapolis, Minn., and the equipment is now working to the satisfaction of its owners. The cooking plant comprises 60 lineal feet of ranges. There are three 3-section ranges, an independent broiler, combination toaster and baker, a large cake griddle, and a croquette frier. The broiler, which is adapted for slow or quick cooking, has three compartments, and a porterhouse stake can be nicely broiled in it in six minutes. A complete device for plate warming is also a feature of the apparatus. The best proof that can be offered that the gas cooking system adopted at the West Hotel has been and is successful is found in the determination of the owners of the Hotel Ryan, at St. Paul, who were interested observers of the new departure at the West Hotel, to arrange their kitchens for gas fuel. The Goodwin Company has installed many large sets of gas cookers, ranges, etc., throughout the country, and in every instance the users have been delighted with the results obtained.

WRITING of the adoption by hotel keepers of gas for cooking, puts us in mind that the proprietors of the elegant new Clarendon Hotel, Brooklyn, N. Y., have installed in their dining room and parlor grates sets of gas logs, that are at once artistic and useful. Visiting gas men to New York city might do well to visit the Clarendon—it is only five minutes' walk from the Brooklyn end of the East River Bridge, with which it is almost in a straight line—to determine just how nicely gas log fires can be made to "look" and "act."

THE Single Tax Club, of Chicago, had a meeting the other night at which the special order was: "The Gas Trust." No wonder Chicago has been dubbed the "Windy City," for certainly if it has many more orators of the stripe that aired their verbosity at the aforesaid meeting, it ought to be something difficult to "hold herself down." One of the orators, a Mr. Jesse Cox, claimed, with the confidence born of belief, that gas cost the Trust not in excess of 6 cents per 1,000 to make and distribute, wherefore the Cox idea was that Chicago could, should and would operate its own gas works. If the latter determination is finally reached, we respectfully urge upon the attention of the authorities Mr. Cox's claims for the Chief Engineership.

GAS men must not believe that Messrs. Connelly & Company, of this city, are paying all their attention to their railway motor. Not by any means; for they are constantly in receipt of orders from gas companies for their specialties. For instance, during the month of September, orders for Connelly governors—chiefly of the 10-inch size—were received from the following Companies: Malden, Mass., San Jose, Cal., Parkersburg, West Va., Cedar Rapids, Ia., Lincoln, Neb., Peoria, Ills., and Stroudsburg, Pa. Iron sponge was shipped during the same month to the following points: Lima, Dayton, Cincinnati, Bucyrus and Circleville, Ohio; Pittsfield, Mass.; Lansing, Mich.; New Castle, Manayunk and Philadelphia, Pa.; and Frankfort, Ky.

LEONARD GILL, Assistant Superintendent of the Corsicana (Texas) gas works, was seriously injured by an explosion of gas on the morning of the 29th ult. The works were crippled and the town was without gas for about a week.

THE following bids for lighting the city of Seattle, Wash., were opened in response to the invitation of the authorities for tenders, the contract to run for 1 year :

Home Electric Company.—Arc lights, 2,000-candle power, all night, $13.50 per lamp per month ; 15-candle power incandescents, $2.20 per month each. Seattle General Electric Company.—Arcs, 2,000 candle power (Thomson-Houston), $12 per month each ; 30-candle power Edison municipal incandescents, $3.50 per month each ; 15 candle power, $2.25 each. The understanding also is that these prices include maintenance and repair charges. The bids were referred.

CABLE despatches to New York, from London, under date of the 4th inst., are to the effect that the Directors of the London Gas Light and Coke Company, on the 3d inst., "emphatically declined to accede to the demand made by the National Gas Workers' Union that only union men be employed in the works. The stokers threatened to strike in consequence of this refusal. A storm has been brewing between the Company and its men for months, and the number of men involved is 6 times larger than the number engaged in any of the previous gas house strikes. The Company is making preparations to conduct its business despite any action the men may take. Long sheds have been erected within the works for living quarters for the non-unionists, and hundreds of beds have been provided for their use. The authorities, too, have taken energetic measures to suppress any disorder. Orders were issued that 800 soldiers at Chatham be in readiness to proceed at a moment's notice to protect the gas works and the men who refuse to join in a strike. Each soldier was served with 20 rounds of ball cartridges. The stokers declare that the reports that they intend to go on strike to force the Company to dispense with non-union labor are unfounded. They say they have no such intention. Moreover, they declare that they made no demands upon the Directors, but only suggested that it would be to the advantage of each side if only union labor was employed in the works. The order to keep the troops at Chatham under arms has been countermanded."

Later despatches contained the following: "This evening a deputation of gas stokers met the Directors of the Gas Company in conference. The Directors declared that they bore no emnity toward the union; that they were perfectly satisfied with the employees, and that they would always give preference to old hands, without distinction between union and non-union men. At a mass meeting of the workmen held later in the evening a resolution was adopted expressing thanks to the Directors and declaring that the men do not desire to strike. There had been slight friction between the gas workers and the Company because the Company declined to discharge men who failed to keep up their subscriptions to the union. The Company applied for military protection in the event of a strike, but it appears that the men equally feared a lockout."

THE proprietors of the San Jose (Cal.) Gas Company have ordered that a reduction of 50 cents per 1,000 in the rate shall go into effect on and after the first prox.

IT is said that "paper" gas pipes for gas distributing services in buildings, are finding favor in Philadelphia. The pipes are composed of strips of manila paper, equal in width to the length of the pipe to be made, the paper being subjected to a bath of asphalt. It is then wrapped firmly and evenly around an iron core until the required thickness is obtained. The pipe is then subjected to a heavy pressure, after which the exterior is sanded and the pipe is bathed in water. The core is then removed, and the interior is coated with a waterproof composition.

IT is said that the United Electric Light Company, of Springfield, Mass., made a net profit last year—presumably for the year ended June 30, 1890—of $28,867, over "expenses and taxes." This, of course, means that no charge to income was made for "renewals, repairs and depreciation." According to the figures given by the State Commissioners for the year ended December 31, 1889, we find it there stated that the capital stock of the United Company was $150,000, and that it had "bonds and notes outstanding" in the sum of $130,508.50. Our readers can draw their own conclusions, therefore, as to the measure of success which the aforesaid "net profit" of $28,867 means to the shareholders.

THE Eau Claire Dells (Wis.) Gas Company's works, the local water works and the Brush Electric Light Company's plant have been purchased by Mr. Weston Lewis (Gardiner, Maine) President of the Maine Trust and Banking Company, and Mr. W. G. Maxcey. The price paid was $375,000, and the properties will be managed in harmony.

THE Common Council of Utica, N.Y., have authorized the City Clerk to advertise for proposals to light the city by arc lights, 2,000-candle power, to burn every night and all night, the contract to run for 3 years from January 1st, 1891. The competition is to close at 7.30 P.M., of November 7th.

THE improvements under direction of Superintendent Cowdery, that are being made at the works of the Milwaukee (Wis.) Gas Light Company—an auxiliary water gas apparatus of the Wilkinson type is a part of the equipment—will cost not less than $150,000. Mr. Cowdery hopes to have everything in working order certainly not later than December 1st.

NOW that a large portion of Montreal is electrically lighted, it was a problem what to do with the disused gas lamps, which are owned by the city. Some of the Aldermen thought it would be a good plan to sell them as old iron, but Ald. Stephens suggested that the lamps might better be put in store "so that the city would not be at the mercy of the Electric Light Company," and the Alderman carried his point.

The Decay of the Mechanic.

The *Age of Steel*, in commenting on the above, says that the good machinist is in demand, and the situation seems to indicate a majority of vacancies and a minority of men. The particular type of skilled artisan that is wanted is hard to find, and the difficulty increases rather than diminishes. One of the causes lies in our modern methods of industrial education. The subdivision of labor, for the purposes of increased production and a cheapening process, has sectionalized our skilled industries; each man has his place in the alignment, and becomes just what the manufacturer wants to make him—a specialist in a certain department. His skill is consequently limited, and his knowledge of a trade confined to the hole in which he acts as a stationary peg. The effect of this, in a general sense, degenerates the tone of industrial ambition, and the man that can command good wages with but one qualification is not likely to double the original stock. In our present system of industrial economics the specialist may be indispensable, but the all-round and thoroughly instructed artisan will always be in demand, and the perpetuation of this rare article be an industrial policy. This can be best secured by an improvement in the system of apprenticeship and less of the shop legislation that in some cases interferes with the rights both of the employer and the apprentice. The attempt to run a young hand in the old rut of skill and product is not wise. A trade is best protected by the excellence of its work, and that mechanic is the most independent who is the best master of his business. A botch workman is an incubus on master and man, and his protection by the union to which he may belong has involved the trades in bitter strikes and much loss.

Our industrial development has made such rapid strides and assumed such enormous proportions that it has necessarily incorporated many incompetent and untrained workmen, who under other circumstances would not have found their way into the higher departments of skilled industries. The consequences are apparent, and the complaint of inefficiency is general. We note some wise and weighty words on this subject in an address delivered by President Penton at the convention of the Brotherhood of Machinery Molders, held in Indianapolis, August last. He says : "It is to be hoped that this convention will see its way clear to take some action toward the establishment of a more uniform and regular apprentice system. Employers in all directions are complaining of the difficulty of obtaining competent mechanics, a trouble arising mainly through the entire lack of any system of educating or teaching apprentices. Large numbers of the so-called molders in the country have picked up a few ideas here and there, and after a brief experience, perhaps in a stove or bench shop, undertake 'to travel,' filling the places, in some instances, of more competent workmen, thus injuring the standing of the trade, and preventing its being learned by those who would develop into good workmen under proper training. An effort should be made to secure the co-operation of employers in the adoption and enforcement of some general system."

This advice is sound and the counsel wise, and its industrial indorsement is the only practical escape from a threatened evil. The younger and coming type of mechanic must not be less than his predecessor in skill, or the pre-eminence of America in mechanics will be a thing of the past, and the art that commanded good wages will be so fractionalized and limited that the less of skill the less of pay, etc.

The Market for Gas Securities.

Another flurry in the money market and many rumors of impending failures caused a rather panicky feeling in Wall street, which resulted in a general decline in quotations. The lowest point, however, seems to have been reached on Thursday, for opening prices of to-day (Friday) are considerably above the close of last night. For instance, Chicago gas, on Thursday, closed at 41⅞, while to-day's opening in the same security was 2 points higher. This stock is a decided purchase at anything under 45. Consolidated shared in the depression, and is now at 97 bid, with but very little stock offering. It is beyond doubt cheap at anything under par, or even 105. Brooklyn shares are dull and strong, with nothing of interest to report about them. Bay State gas is somewhat in disfavor just now, being quoted at 64 to 66, and it certainly looks tempting. Laclede gas is very weak at 12 to 15, and Consumers gas, of Jersey City, looks for buyers, at 30. Baltimore Consolidated is at half par, and we look for a good advance in it before the winter is at an end.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

October 13.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	97	—
Central	500,000	50	90	100
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	124	127
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	—
Mutual	3,500,000	100	120	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	40	45
Preferred	5,000,000	100	85	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	120	123
Citizens	1,200,000	20	97½	98½
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	136	138
" Bonds	300,000		100	105
Peoples	1,000,000	10	95	98
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	1,000,000	100	109	111
Nassau	1,000,000	25	130	—
" Ctfs	700,000	1000	100	102
Williamsburgh	1,000,000	50	—	128
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	93	93½
2d " " "	3,000,000	1000	71	72
Bay State Gas Co.—				
Stock	5,000,000	50	64	66
Income Bonds	2,000,000	1000	95½	—
Buffalo Mutual, N. Y.	750,000	100	90	95
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160

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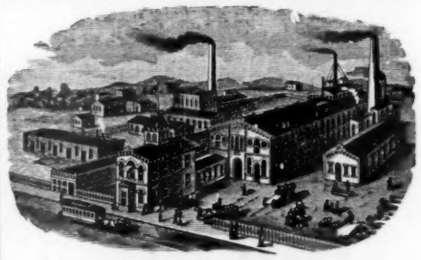

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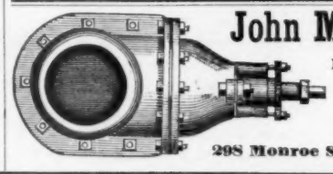

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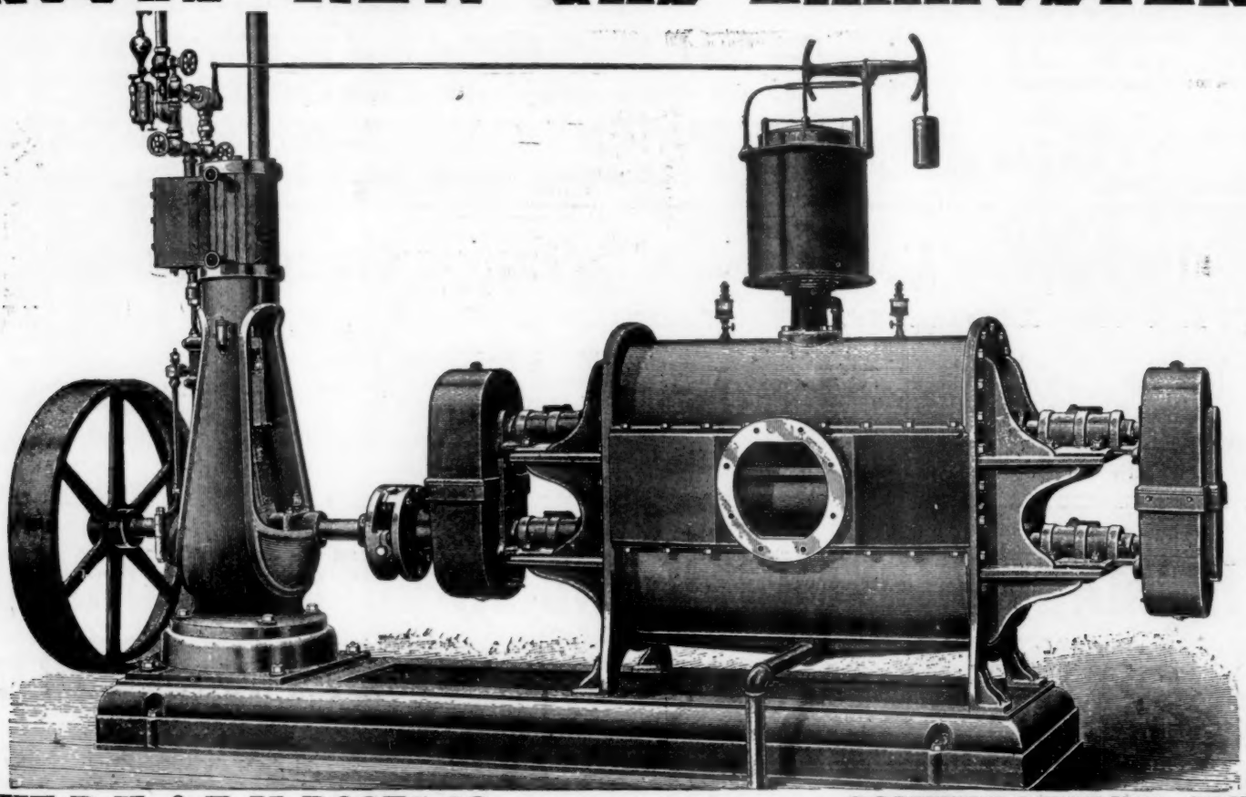

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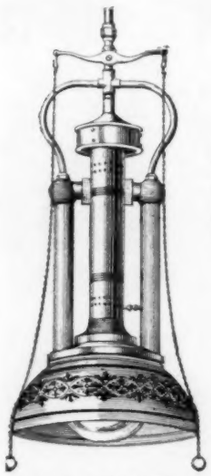

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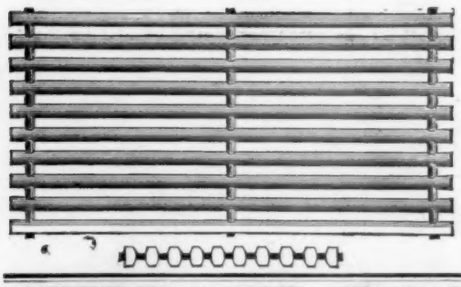

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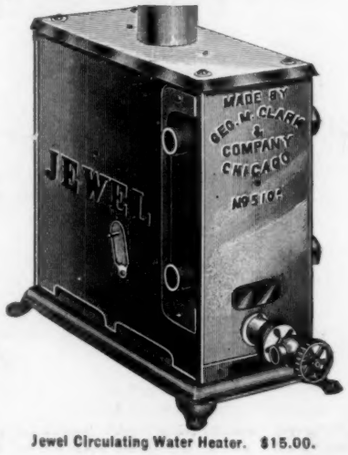

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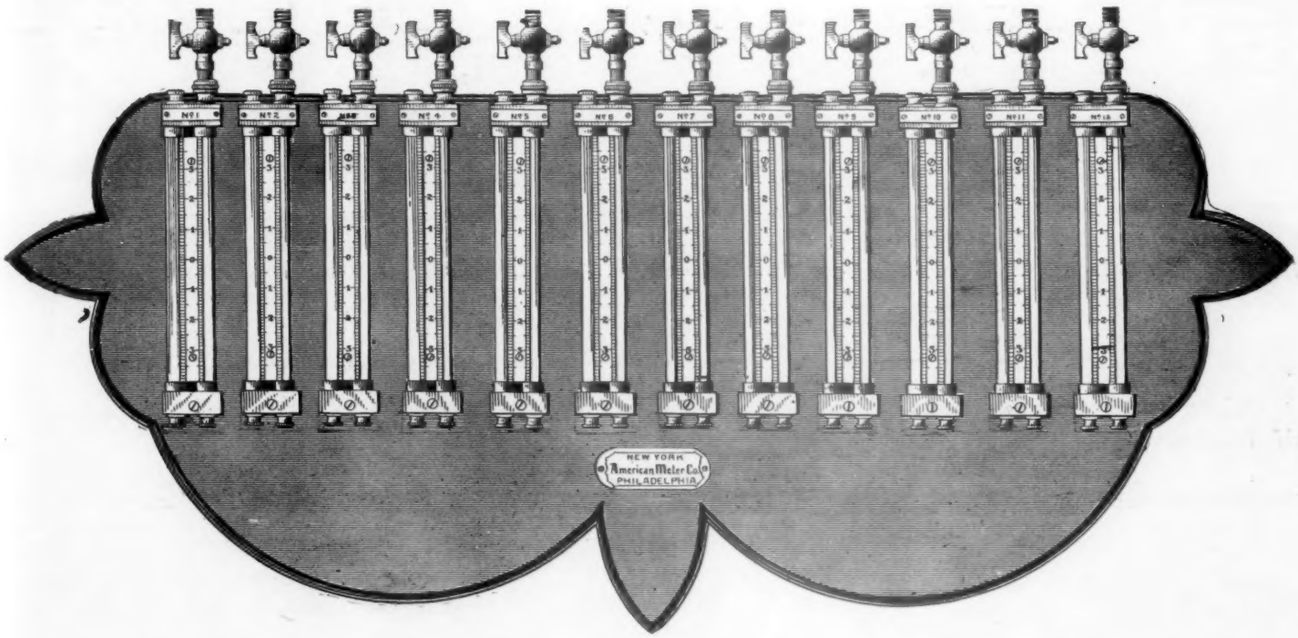

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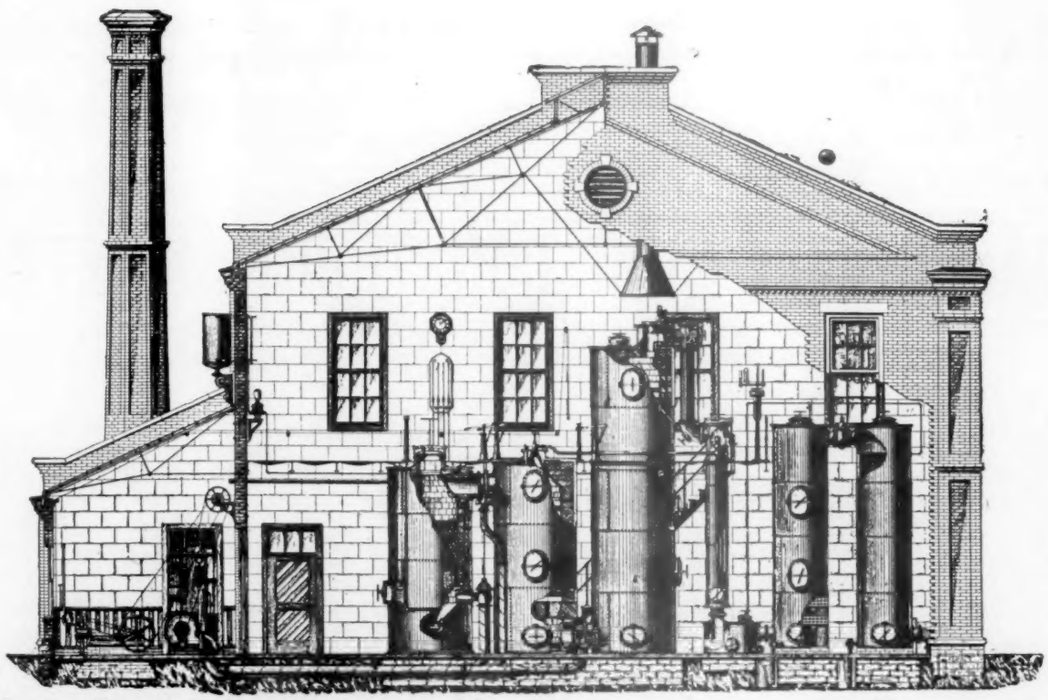

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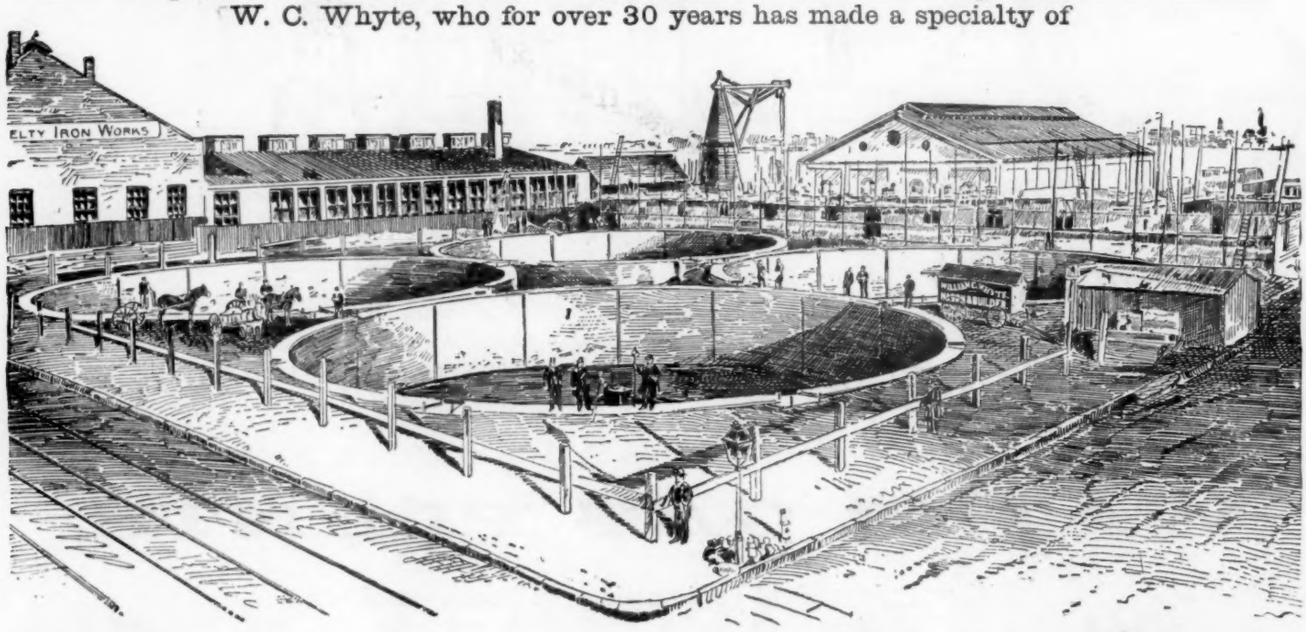

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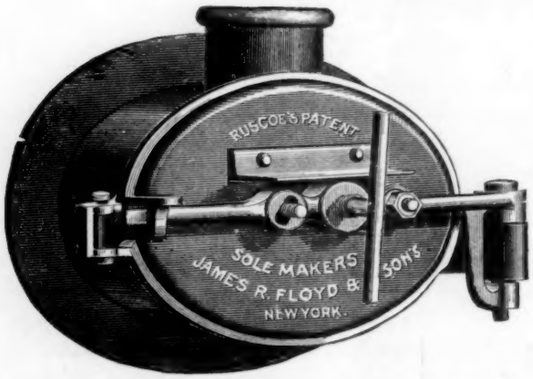

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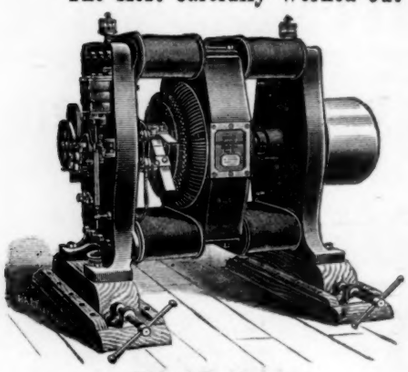

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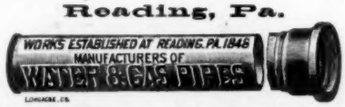

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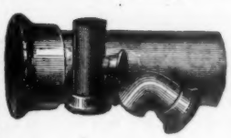

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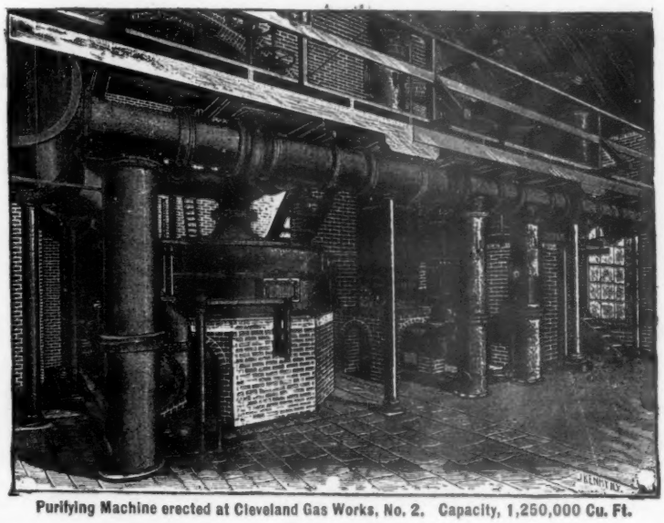

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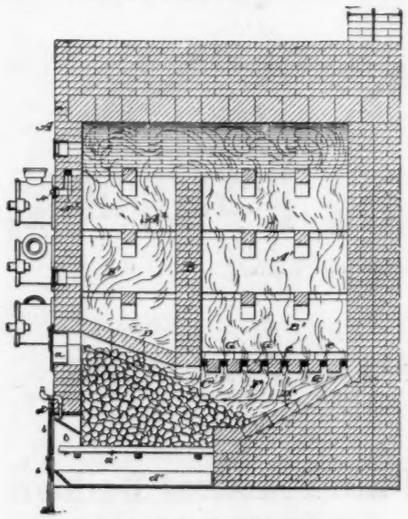

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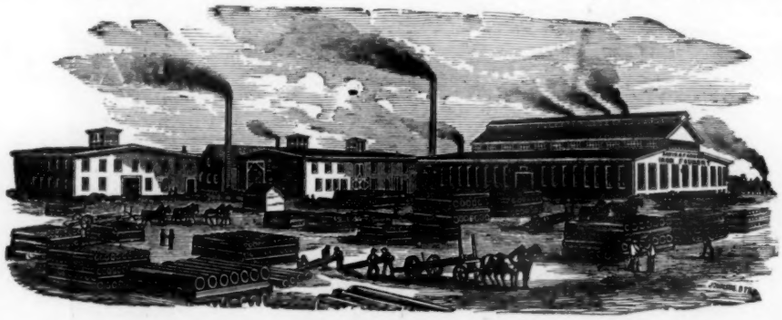

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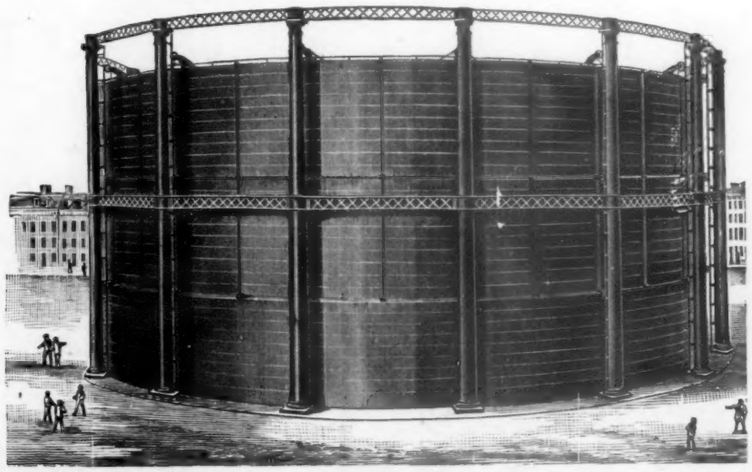

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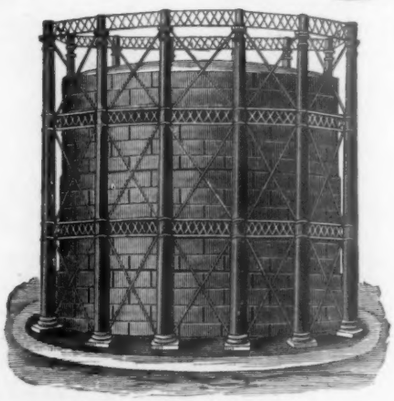

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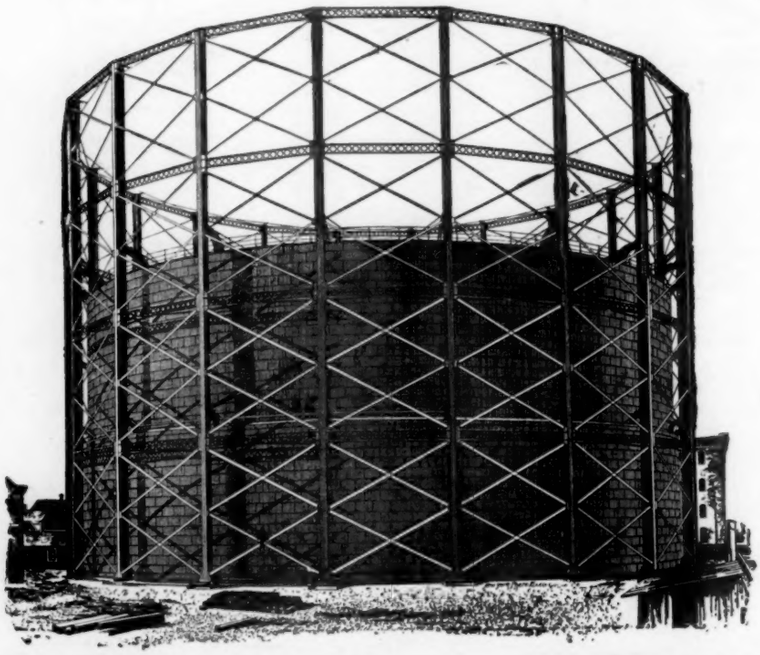

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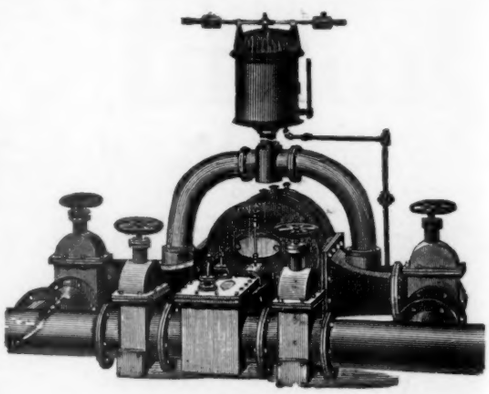

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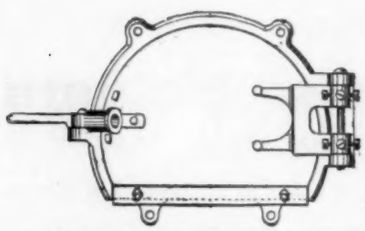

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} equal to { **750,000 Candle Feet of Gas, and 26 Bushels of merchantable Coke weighing 900 Pounds**

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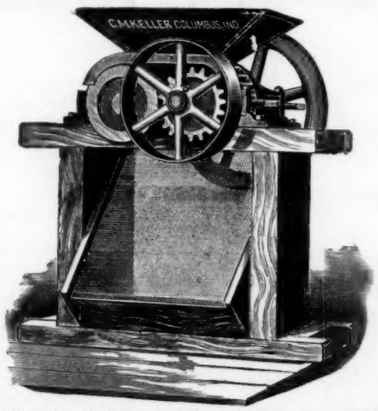

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The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17¼ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14½ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

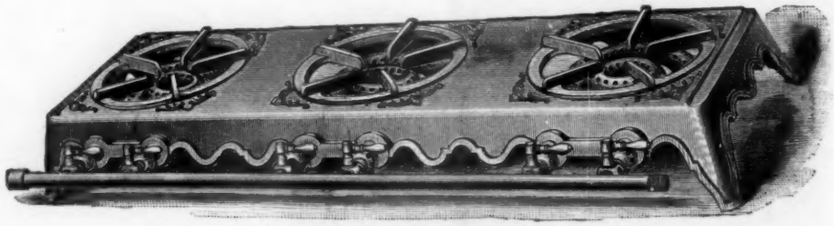
This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.



HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

½ in. supply pipe should be used where the pressure is 1 in. or over.